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ROAD MAINTENANCE SYSTEMS AND METHODS*

Intermittent, Patrol and Gang Systems of Maintenance —Comparative Advantage of Each—The Ideal System—How to Maintain Earth Roads—Maintenance of Gravel and Stone Roads.

By M. O. ELDRIDGE, Assistant in Road Management, U. S. Office of Public Roads.

There is no phase of the road subject which is more important than that of maintenance. The impression is quite general throughout this country that there are certain types of roads which are permanent. This is a mistaken idea. No permanent road has ever been constructed or ever will be. The only things about a road which may be considered permanent are the grading and the concrete culverts and bridges, and even they may not be lasting.

Roads constructed by the most skillful and experienced highway engineers will soon be destroyed by the traffic, the frost, the rain and the wind unless they are properly maintained, but the life of such roads may be indefinitely prolonged by continuous and systematic maintenance. Even a poor road may be greatly improved by proper maintenance. In other words, a poor road with proper maintenance may become better, in time, than a good road without it. Damage to a road from traffic or weather may be repaired at its inception with a slight expenditure of time and money, but if allowed to go on without attention for a considerable length of time it will involve a heavy outlay for repairs, and even threaten the existence of the road.

SYSTEMS OF MAINTENANCE.

There are several systems of maintenance in use in this country, among which may be mentioned the intermittent system, the patrol system and the gang system. Under the intermittent system should be included the working of certain roads by toll-gate companies, and the maintenance of roads by contract and by citizens in working out their property and poll taxes. Under the patrol and gang systems should also be included the combination of the two systems.

The intermittent system is that under which roads are repaired or maintained spasmodically once or twice a year. This is the system, or rather lack of system, which has prevailed throughout the United States until within the past few years, and needless to say it is the one under which the poorest results have been secured.

There may be some reason for toll roads, but, on the whole, this system is un-American, contrary to the spirit of our free institutions, and has been found unsatisfactory. The reason for this is that the tax is too direct and burdensome to be borne by the road users alone.

The contract system has been used to some extent in various states, but has not been found entirely satisfactory. As a general rule, the work is let to the lowest bidder. The amount paid for the work is small, and such poor service is rendered by the contractors that in many cases the roads have become worse rather than better. Under proper engineering supervision and inspection, and with plans, estimates and specifications prepared in advance, the contract system of maintenance might prove as efficient and economical as in construction work.

Under the personal service or labor tax system no state, county, town or township has ever built or kept in repair a system of first class improved roads. This system is not applicable to any class of road work, with the possible exception of earth road dragging, in sparsely settled portions of the country. The principle of working out the road taxes is unsound, unjust and wasteful, and the results obtained under it are unsatisfactory many particulars. During the past few years many of the states have abandoned this method. It was abolished in France about 125 years ago. It is estimated that of the eighty million dollars spent on roads in the United States in 1904, approximately thirty million dollars was worked out, whereas, in 1913, of approximately one hundred and eighty-six million six hundred thousand dollars spent on roads, only about fifteen million dollars was worked out.

The patrol system is that which provides for the permanent employment of skilled laborers or care-takers, each of whom has charge of a particular section of road.

The gang system provides for the employment of a corps of skilled laborers, who may be assigned to any part of a county, township or town where the work is most needed. This system is particularly effective for bituminous-macadam repairs.

The patrol system has been used very successfully in France for over one hundred years, and there is no doubt that it would give satisfactory results in many of the most densely populated sections of this country. It has been used to some extent in Maine, New York, Massachusetts, Maryland, New Hampshire, Connecticut, Rhode Island, Pennsylvania, and in a few counties in various other parts of the country. Men who are constantly employed in this way become experienced in their particular lines of work. They soon learn to do the work well, and will take pride and interest in it. There is no doubt that in certain kinds of maintenance operations one man will accomplish more and better results in 313 days than 313 men will accomplish in one day.

The ideal system would appear to be a combination of the patrol and gang systems whereby the patrol men or care-takers look after their particular sections of road during certain seasons of the year, and at other times work together in small gangs. A parallel to this system is found in the maintenance of way departments of our great railways. These provide patrolmen and track walkers who look after small defects, and section gangs to do the work which requires more than one man's services.

*Paper read at Maine State Road Convention at Bangor, April 8th, 1914.

The assignment of care-takers or patrolmen should be left entirely to the engineer in charge. In this way the system may be rendered more elastic and more efficient.

It would be impossible to adopt the patrol and gang system everywhere throughout the country, on account of sparse population and limited resources, but there are many communities in which it might be used. It is difficult to find a community which is so poor that it could not afford to employ eight or ten laborers and three or four teams continuously, and there are thousands of towns, townships and counties which could afford ten times such a force. That such a plan would be more efficient than the intermittent systems would appear to be self-evident.

In dealing with the subject of maintenance aside from its administrative features, the only wise and safe plan is to provide, after making careful estimates, for a cash appropriation sufficient to maintain every mile of new road constructed. Funds should also be provided for taking care of the old roads. These appropriations and expenditures should be kept absolutely separate from the construction fund, and if it is possible to do so the maintenance funds and the repair funds should also be separated. *If a community can not afford to set aside a fixed and adequate sum for the maintenance of a high class road, then it is doubtful whether it can afford to build such a road.*

METHODS OF MAINTENANCE.

The methods to be employed under any system will vary with the type of road to be maintained and the character of traffic. To deal with these phases of the subject in a satisfactory manner would require more time and space than can be devoted to it in a short paper. This part of the subject will, therefore, be confined to a few brief suggestions regarding the best methods of maintaining earth, gravel and macadam roads.

Earth Road Maintenance.—The first and last commandment in earth road maintenance is to *keep the surface well drained.* To insure good drainage the ditches should be kept open, all obstructions removed and a smooth crown maintained. Except for very stony soil, the road machine or scraper may be used very effectively for this work. The machine should be used once or twice a year, and the work should be done when the soil is damp, so that it will pack and bake into a hard crust. Wide and shallow side ditches should be maintained with sufficient fall and capacity to dispose of surface water. These ditches can in most places be constructed and repaired with a road machine.

All vegetable matter, such as sods and weeds, should be kept out of the road, as they make a spongy surface which retains moisture. Clods also are objectionable, for they soon turn to dust or mud, and for that reason roads should never be worked when dry or hard. Boulders or loose stones are equally objectionable if a smooth surface is to be secured.

A split-log drag or some similar device is very useful in maintaining the surface after suitable ditches and cross section have once been secured. The drag can also be used on a gravel road just as effectively as on an earth road. The principle involved in dragging is that clays and most heavy soils will puddle and set very hard when wet. The essential requisite, therefore, is that the work be done at the proper time. This is the point which seems to be the hardest to impress on the average man. The little attention that the earth road needs must be given promptly and at the proper time if the best results are to be obtained.

In dragging roads only a small amount of earth is moved, *just enough* to fill the ruts and depressions with a thin layer of plastic clay, which packs very hard, so that the next rain, insted of finding ruts, depressions and clods in which to collect, runs off, leaving the surface but little affected.

The drag should be light and should be drawn over the road at an angle of about 45 degrees. The driver should ride on the drag and should not drive faster than a walk. One round trip, each trip straddling a wheel track, is usually sufficient to fill the ruts and smooth out the surface. If necessary, the road should be dragged after every bad spell of weather, when the soil is in proper condition to puddle well and still not adhere to the drag. If the road is very bad it may be dragged when very wet and again when it begins to dry out. A few trips over the road will give the operator an idea as to the best time to drag. Drag at all seasons, but do not drag a dry road. The road will freeze smooth if dragged just before freezing weather.

The slope or crown should be maintained at about one inch to the foot. If the crown becomes too high it may be reduced by dragging toward the ditch instead of from it. If the drag cuts too much, shorten the hitch and change your position on the drag. If it is necessary to protect the face of the drag with a strip of iron, it should be placed flush with the edge of the drag and not projecting. A cutting edge should be avoided, as the main object in dragging is to *smear* the damp soil into position. The dragging of roads may be encouraged by offering to care-takers or patrolmen special bonuses or prizes for the best mile of road.

Maintenance and Repair of Gravel and Stone Roads.—The following suggestions may be found useful in the maintaining of gravel and stone roads. Culverts and ditches should be carefully inspected at frequent intervals and all obstructions removed. If the weeds are cut from shoulders and ditches grass will soon take their place. Whenever a mile of new stone road is constructed the contractor should be required to place about 100 tons of 1½-inch stone (ordinarily referred to as No. 2 stone) and screenings at convenient places for maintenance and repairs. During the summer months stone chips only should be used for patching.

The rake is one of the most useful tools used in stone or gravel maintenance. Large patches of stone or gravel should not be spread over the whole road at one time, especially in dry weather. All repairs should be made before cold weather, so that the road will consolidate and go through the winter in good condition. The best time, however, to patch stone and gravel roads is in the spring of the year. The spring showers will aid the traffic in consolidating the materials.

Before applying new material, all projecting stones should be removed and the surface slightly roughened with a pick. In applying new material thick layers should be avoided. One stone deep is ordinarily thick enough, and no stone used for repair work should be larger than two inches in diameter, and the size should be smaller for patch-work.

Trap rock, granites and other hard rocks should be broken finer for repair work than limestones and other softer rocks. Never crack stones on a road if you desire to secure a smooth surface. A thin layer of screenings, preferably trap rock, applied to a gravel road will produce a wearing surface almost equivalent to macadam.

Newly laid stone for patch-work or repairs should be bonded with screenings or a good quality of gravel. An excess of binder, however, should be avoided. In cutting away the worn out material for gravel and stone road shoulders all road scrapings, horse droppings and

other rubbish should be kept off the road. Such materials will ruin the best road ever constructed.

The care-taker should never neglect an opportunity to remove loose stones from the road surface. Loose stones or water-worn pebbles should not be used for repairs or maintenance, as they will not bind.

Earth should not be used for patching stone or gravel roads, for earth turns to dust and after the first rain dust turns to mud. A mud blanket over the road will prevent it from drying out and hasten its destruction. The middle of the road should always be a little higher than the sides so that it will shed water quickly. This crowning, however, should not be carried to such an extreme that vehicles are forced to use the center of the road only, thus confining the wear to two wheel tracks.

If the road is so badly worn or rutted as to require rebuilding the best practice is to roughen the surface with a scarifier drawn by a roller, or by means of spikes placed in the driving wheels of the roller. The surface is then harrowed and all large stones removed. After bringing the surface to the proper crown and cross section a layer of No. 2 stone is applied, bonded with screenings, sprinkled and rolled in the same manner as for the original construction.

THE PRICE OF GOOD ROADS IS ETERNAL VIGILANCE IN MAINTENANCE.

ROAD MAINTENANCE IN VARIOUS STATES

Systems and Methods Employed in Ten States, Described by the Officials of the State Road Departments—Earth, Gravel, Sand-Clay, Macadam, Bituminous Macadam and Others—Cost Per Mile

MAINTENANCE OF NEW HAMPSHIRE ROADS.

The total assessed valuation of the state of New Hampshire is only $23,000 per mile of the highways of the state. About 500 miles of these highways run to a great extent through a country where the cost of building such a highway as some states demand would have been more than the value of all the abutting property. To meet this condition, three-fourths of the mileage so far constructed has been gravel, about one-fifth is water-bound macadam and the remainder is graded earth. With considerable automobile travel to and through the White Mountains, and more or less everywhere, the comparatively cheap construction involves unusual care in maintenance. How this is conducted is explained by the state superintendent, of highways, S. Percy Hooker, in the following article:

I believe that it is absolutely imperative that, no matter what type of road is used, as soon as it is constructed it be put in charge of a patrolman. With a gravel road the patrolman can at once find steady work. If it rains, he employs the split log drag to bring it back into section. If it does not rain he can find slight depressions in the roadway which require the addition of small quantities of material. If he is a good patrolman he has absolutely no leisure upon the road.

The trunk line roads in New Hampshire furnish practically ideal conditions for the establishing of the patrol system. About 80 per cent of these roads are dirt or gravel roads. At present 77 patrolmen are at work upon them, who cover practically all the trunk line roads, and also the state aid or detached roads wherever there is sufficient length in a town or the combination of one or two towns to furnish work enough for the patrolman. These men are paid from $3 to $3.50 a day and furnish a horse, cart and the hoe, shovels and small tools necessary for their work. On all gravel roads the state furnishes a one-horse split log drag and on oiled macadam roads a portable asphalt heater with which to do their patching.

The patrol system is used on trunk lines and some state aid roads. In other towns state aid roads are maintained by town selectmen under the direction of the State Highway Department. The total expense to both state and town of maintaining trunk lines and state aid roads in 1913 was $171,162.19, which is $196 per mile.

With 70 per cent of our road gravel which has not been treated with any bituminous substance, the main work of the patrolman is along the lines of dragging and building up a road surface with local material.

In a general way, the macadam roads are all treated with a hot oil, while a very small percentage of gravel roads are treated with the cold oils. Bituminous roads, when the flush coat is pretty well worn out, are covered with hot oils exactly as the water bound macadam are. The cost of the hot oil treatment, including the application, cover, etc., with, in many instances, some little patching, costs approximately nine cents a yard or, upon our 15-foot roads, about $800 per mile.

We find, on the whole, that such treatment averages once in two years, though in some instances roads oiled three years ago do not yet require a second coat, while in other places it is necessary that the application be made two years in succession with the probability that in some instances two years' wear will be gotten from the road before re-application.

We have tried the application of the cold 60 per cent asphaltic oils upon gravel roads with varying success. I think largely the success is dependent upon the condition of the roads when first oiled. The application of this oil followed by a cover coat of gravel or pea stone upon a gravel road in its ordinary condition tends to develop immediately after the application of the oil a pockety condition in the road and the breaking through of the surface in many places. I attribute this largely to the fact that the road itself under these places was not entirely firm and satisfactory.

It is necessary for the patrolman to immediately fill up these holes with extra gravel and in our state we mix this gravel with a hot oil, instead of with the same product with which the road was oiled. I think in most instances this treatment would seem very unsatisfactory to the beginner until the patching had been thoroughly done by the patrolman; but after the first three weeks, there would be comparatively little of this patching to be done.

Many experts who have used this general method say that the patching should be done with the same oil with which the road is covered; but personally, I have not got as satisfactory results in that way, as it is almost impossible to cement the gravel into the surface holes with the lighter oil.

After three weeks or a month from the application, these roads have a semi-asphaltic surface and usually wear well throughout one season. It was my hope that this treatment would be cumulative and that each year we would require less of the No. 6 oil; but I find in practice that although after two applications in succeeding years there is considerable of the asphalt left in the roads, the only satisfactory way is to put the drag on, bring the surface to the proper section, and resurface with oil.

The cost of this sort of treatment is from four to five cents a square yard, or about $400 per mile, and so far it has had to be repeated annually. There is one strong ob-

jection to this form of treatment. Your road gets out of section and flat in the center, so that the latter part of the season it tends to hold water on the road surface. I think the oil stops most of the penetration into the road, but there are more or less puddles after storms, and the road is not as even as an untreated gravel road.

I have used with excellent success on one section of a gravel road a surface treatment with the by-product of the pulp mills, and I intend to use it upon a considerable longer section this year, but I am not prepared to say what the ultimate results will be until after a longer trial.

I tried, last year, on one section of gravel road, where the preceding year 60 per cent oil was used, a treatment of 90 per cent hot oil. This was satisfactory last summer, but it has not been inspected and reported upon this spring.

With these few exceptions I have kept the gravel roads as gravel roads, without any pretense of making them anything else. It is really astonishing in how good condition these roads and the ordinary earth roads may be kept under the patrol system, by using the drag after each rain and carting enough material to fill up all holes or slight depressions.

In Vermont.

By M. E. SHEDD, Clerk, Office of State Highway Commissioner.

The question of maintenance is most important, and is pretty nearly all there is to the road problem. The building of roads is a simple matter, comparatively, but the maintaining of them is difficult and expensive. It is likely to prove a formidable question of finance to many states that are building expensive types of roads. We have not had in this state the laws nor the money to maintain what roads we have built. It has been left almost entirely to the towns what they should do or what they should spend upon the roads already built. The only check the state has had upon them is the maintenance fund derived from the automobile registrations, which is used in assisting them in maintaining their state roads, and which the state can withhold if the town fails to properly do its work. This has done quite a little good, but it is not sufficient. The last legislature opened the way for the patrol system, and this last year it was tried out in a few towns with some considerable degree of success. It will be tried out more extensively and more completely this year.

The work of maintaining a road should be continuous from the moment the road is finished. The road drag, in intelligent hands, will do the work upon gravel roads or dirt roads. It can be used to spoil the road, in hands not caring for the quality of the work done. Continuous intelligent work, with the funds to pay the bills, will maintain any system of roads.

We have no reliable data as to the cost of maintaining our roads in Vermont. If we were to guess at it for a period of 10 years, under proper handling, would say from $100 to $150 per mile, including resurfacing. This would mean upon a road newly built, or one that was in proper condition to maintain. The maintenance fund in this state was $100,000 last year.

In Massachusetts.

There are about 20,000 miles of improved roads in Massachusetts, of which about 7,200 miles are dirt, 8,700 gravel and 2,325 are plain macadam. About 1,200 miles have been treated with bitumen and 450 are classed as "pavement." Here, as in New Hampshire, a big problem is to get the best service possible out of the cheaper roads—the dirt and gravel. Concerning this Col. William D. Sohier, chairman of the Massachusetts Highway Commission, says:

We are encouraging the towns in every possible way to keep all of their roads constantly repaired and maintained, to keep all of their culverts and gutters constantly free and open, and the road always so shaped that the water runs off the road into the gutter through the culvert and away from the location.

We are helping the towns to secure log drags and trying to encourage them in every way to use them after every rain. The last year or two has seen great progress in this line. Quite a number of towns now have from three to seven drags in the town, and a man in charge of certain sections of road keeps using the drags once or twice a month, after each rain, when the road is dried out sufficiently not to be sticky and is still wet enough to pack.

We find that these country roads are extremely satisfactory to ride over, and are very much appreciated by the visiting automobilists; although, to be sure, they are broken up by the frost for a few weeks in the spring, as they have not adequate foundations.

What we are trying to do is to improve as many miles as possible in a relatively permanent way year by year, and meanwhile to maintain all of the roads in reasonably passable condition, constantly repairing, constantly shaping and maintaining them in the best condition possible at minimum expense.

In our state our state highway maintenance on about 980 miles of road is costing something over $700,000 a year, and, while we are maintaining our roads in very good shape, we are not reconstructing or resurfacing enough miles a year to make up for the wear. In other words, some of our roads are twenty years old and need resurfacing, but we haven't money enough available.

The state has been appropriating $200,000 a year towards the maintenance of state highways, and we have secured something over $500,000 from the motor vehicle fees. The counties repay to the state 25 per cent of the amount the state appropriates. Until last year the towns and cities by law repaid not exceeding $50 a mile a year. Under a statute passed last year, the towns and cities will repay to the commonwealth not exceeding one-half the cost and not exceeding $50 a mile a year, in towns of under one million valuation; $100 a mile a year in towns of between one and two million valuation; not exceeding $200 a mile a year in towns between two million and five million, and not exceeding $500 a mile a year in towns and cities of over five million valuation; with the further limitation that we can collect balances for the next three years, or four years in all, making the most we can collect $2,000 a mile, all the time with the limitation that we must spend at least twice that much. This collecting back applied only to the state appropriation, but there is an amendment pending this year to make it apply to any money spent from whatever source received.

Maintenance work begins on most roads the day the road is opened for travel. We have a few roads where the maintenance of road surface is extremely small, these being roads where we have used the more expensive type of construction, but all the time you have gutter and shoulder work, catch basins, etc.

In Rhode Island.

By IRVING W. PATTERSON, Engineer State Board of Public Roads.

The maintenance work in 1913, aside from the general repair work, consisted in the resurfacing of 6.26 miles of road as bituminous macadam, and 3.96 miles as waterbound macadam. A surface coat of bitumen was applied to 31.07 miles of bituminous macadam.

The work of maintenance is carried out both by the patrol system and by section gangs.

All money for maintenance is derived from two sources

—appropriations at the discretion of the General Assembly and the income from the automobile department. There is no regular annual appropriation fixed by law for maintenance or construction.

In Connecticut.

By CHARLES J. BENNETT, State Highway Commissioner.

There are three divisions of the State Highway Department—construction, repairs, and accounts and records. The repair department has its own independent system. Its map is divided into nine districts, and the heads of repair work in each of those nine keep the chief of repair informed at all times of the state of things in their district. Indeed, most detailed records are kept and they show when the time comes that it is better economy to rebuild a road than to continue repairing it.

The state bears all expense of maintenance of the state road system, not only the roads built by the state or with state aid, but also those built by towns which are up to state standards and have been acepted by the state department.

The actual cost of maintenance under the present system of trunk line roads, about 900 miles in length, should be approximately $900,000 per year. Of this sum, the automobile tax provides approximately $400,000, leaving $500,000 per year to be provided by state appropriation for trunk line repairs.

In addition to this amount of money for repairs only, there must still be provided annual sums for renewals of the roads originally cheaply constructed, or roads which have worn out under the traffic as mentioned. This sum can only be roughly estimated, but may be considered as amounting to about $500,000 a year, to be applied over a term of eight years. At the end of this time the seven main trunk roads will be continuously constructed with a type of road surface suitable to traffic requirements.

This will make necessary appropriations for repairs and renewals of trunk lines of $2,000,000 each fiscal term of two years. The amount of $900,000 a year will never be less, but will increase in proportion as the number of miles of improved road increases. There will also be appropriations of approximately $150,000 a year for repairs to state aid roads.

The large amounts needed for maintenance and renewals will make it unwise, in my opinion, to provide for any further immediate trunk line construction unless some means is devised for securing money other than by the issuing of long-term bonds.

In New York.

By JOHN N. CARLISLE, State Commissioner of Highways.

Prior to the amendments to the New York State highway law in 1913, the maintenance work in the department was conducted under an entirely separate organization from the construction work, there being six divisions of the state in charge of the division engineers and having to do with the construction of highways, and eight divisions having charge of maintenance.

By the amendments of 1913 it was directed that the work of maintenance and construction should be consolidated under the division engineers and that the number of the divisions in the state should be increased from six to nine. The sum of $3,353,000 was appropriated for the maintenance of these roads, and this amount has either been appropriated or has been obligated by the department for the repairs of roads for this spring, so that the entire money has been either paid out or is now actually appropriated for specific roads, contracts for which are either awarded or will be awarded in the very near future.

During the year approximately one thousand additional miles of state and county highways were completed, making, in round numbers, 5,000 miles of state and county highways to be maintained and repaired during the coming year. The provisions of the statute require that the department shall organize a force so that every section of our state and county highways shall be under constant observation and shall be effectively and economically preserved, maintained and repaired. This requires, during the coming year, the organization of such a force as will cover every improved state and county highway and necessarily involves the expenditure of a large amount of money.

A very careful study has been made of every completed state and county highway, its present condition and the amount of money necessary to place it in proper repair, and to keep the road under constant observation, and at least the sum of $4,838,417 should be appropriated for the next year if we are to carry out the clear provisions of the statute.

The most difficult problem confronting the department to-day is the question of maintenance, and this will continue to be so in the future, for as the construction work increases, necessarily the maintenance must also increase and eventually the problem will be entirely one of maintenance. The patrol system, as a rule, has not been entirely satisfactory, and it is believed that section gangs, properly organized, may result in giving better care to our roads, and the coming year we intend to use both the patrol and the section gang, and carefully study the cost data and see which system will produce the best results.

The troublesome question of maintenance relates to the doing of ordinary repairs early in the season. These repairs, necessarily, cannot be done under contract, and include the cleaning out of ditches, the regrading and rolling of the shoulders of the roads, the patching of small holes and the applying of oil where necessary to make the road dustless.

I have given a great deal of thought to this matter, and talked with a great many men interested in the good road problems, and I believe that the solution is to amend the law so as to provide that the State Department of Highways can enter into a contract with the county superintendents of highways of the different counties to do this ordinary repair work.

In order to make this effective the law should provide that the town superintendents, under the direction of the county superintendents, should be required to do these repairs on state and county highways within their towns, at the opening of the season, so that this work will be done before the town superintendents take up the town work proper. Such a law, of course, should provide for the payment by the state, out of the maintenance money, for the salaries of the town superintendent and men employed by him, for the purchase of such materials as crushed stone, etc., as are necessary, and for the renting of the town machinery.

If such a law is passed I believe that within a month after the season opens in the spring that we can do the ordinary repairs upon every state and county highway within the state, and can place them in good, safe condition for travel; that such a course will meet with the heartiest approval of everyone interested in good roads, and I earnestly recommend that such legislation be passed.

In Maryland.

In maintaining its roads, the state of Maryland has for several years past adopted the plan of furnishing and applying the stone covering, but having the bituminous material applied under a contract by the company which manufactures it. In 1913 a contract was made covering some 34 pieces of road in nine counties on the eastern shore of Maryland, the total area involved being 976,071 square yards. It was provided that all of the work should be completed before July 31, under a penalty of $25 per day for delay beyond this time, the state agreeing to pay the company the same amount for every day that it delayed the work by not being ready for applying the covering material. The company applied 342,785 gal-

lons of material at a rate varying from one-fifth to one-half gallon per square yard, and averaging 0.366 gallon per square yard. The state forces covered this with an average of 12 pounds of stone chips per square yard. The state purchased the stone and had it delivered in piles along the roadside early in spring, when teaming was least expensive. The bituminous material was applied with two motor trucks, which began work on May 28, one finishing its half of the work on July 18 and the other the remaining half on July 30. Accompanying these two trucks were two gangs of the state forces, each consisting of twelve men and an inspector, which applied the stone chips.

Previous to letting the contract, the highway engineers of the state prepared a schedule showing the location of the sections of roads to be treated, laying out the work so as to cover all of these sections with the least amount of moving about. In 1912 such a schedule had not been made out, and the trucks frequently had to make long jumps between different pieces of work, with considerable loss of time. The advantage of operating under a pre-determined schedule is shown by the fact that the days lost by repairs and delays in 1913 were only 6, as compared with 22 in 1912; time lost in transit was only 18, as compared with 24, and the percentage of days worked was 72, as compared with 66 in 1912. The average number of gallons applied per day in 1913 was 4,760, and the average number of square yards treated per day was 13,550.

After this schedule had been made out, it was submitted to the bidders and incorporated as a part of the contract. The prices were for sweeping surfaces previously treated with bituminous material, sweeping surfaces not so treated, and a price per gallon for supplying and applying the bituminous material at the approximate rate shown on the schedule. One advantage of this method of contracting is that the company which supplies the material also places it on the road, and is therefore vitally interested in securing the best possible results from the use of its material and has no incentive to slight the sweeping and other details of application which have such an important bearing on the durability and other satisfactoriness of the work.

In Virginia.

No appropriation is made for maintenance of roads built with state aid, and no general system is employed in maintenance work.

In Illinois.

By A. N. JOHNSON, Chief State Highway Engineer.

In regard to the action taken by the state to provide for maintenance of state aid roads, it is understood that the State Highway Department will do this, but there has been no appropriation made to cover this work. It is understood that the appropriation will be made as soon as the roads are built and will require the maintenance. Our experience in the building of macadam and gravel roads is that maintenance should begin immediately after being built and watched very carefully during the first year. After that, in some sections of the state, the roads will take care of themselves for two or three years.

In Michigan.

The highway department each year awards to each township or county, for maintenance, two per cent of the total cost of every road whose construction was approved by the department and the maintenance of which also has been done according to the rules of the department. These rules cover dragging and patching gravel and earth roads, and keeping macadam and concrete in good condition.

SLAG ROADS IN MISSISSIPPI

Experience of Road District Number Three in Building Such Roads in a Flat Country—Clay Base Better Than Sand.

By CHAS. E. CHIDSEY, Commissioner of Road District. No. 3.

The first slag road to be constructed by the commissioners of Mississippi Road District No. 3 was one leading from Laine, on the L. & N. R. R., to the plant of the Southern Paper Company, then in course of construction, and just one mile distant. This 22-foot road had been partially constructed by the board of supervisors prior to the establishment of the separate road district in August, 1912. This and the fact that a spur track from the railroad paralleled this road to the paper mill, and thus made it convenient to deliver the slag, were facts which caused the commissioners to select it for a test of slag for its public roads.

The slag was ordered from the Birmingham Slag Company of Birmingham, Ala., the only specification being that it was to be 2-inch slag. The price paid was 25 cents per ton f. o. b. Birmingham; the freight was $1.25 per ton, and the hauling and spreading 50 cents a ton, making the total cost $2 per ton. Eight hundred tons were used on the mile of road. Experience of the road commissioners with this and other roads shows that the finer the slag the better, as coarse slag grinds down with difficulty and is apt to make the road lumpy.

In constructing the road, it was first hollowed out to a depth of 6 inches, then filled with slag and rolled with an 8-ton roller, after which it was covered with earth

FIRST SLAG ROAD IN SOUTH MISSISSIPPI.
L. & N. R. R. at the right; paper mill at the right background. Taken April 14, 1914, after a rain. Small puddle at left foreground is only defect.

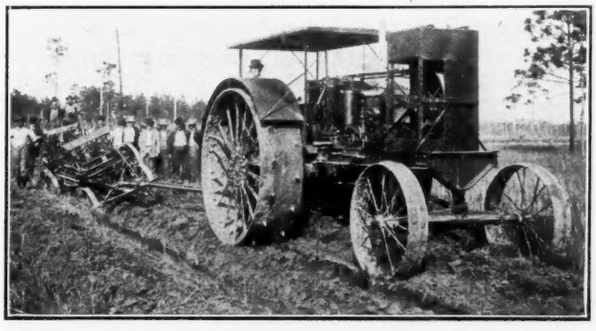
to a depth of several inches and again rolled. Sand was used for the covering in this instance, but since then rich deposits of clay have been discovered near the roads and have been used by the commission. At first this road was somewhat rough, but under constant use of heavy vehicles it has worn down to a uniform smoothness. The country over which the road runs is about 18 feet above sea level, and as it has a sandy sub-soil and is slightly rolling, it was easily drained.

The success of this experimental road was such that the commissioners determined to make a more extended use of slag, and selected the "Old Mobile Road" between the city of Pascagoula and Laine, which road was originally constructed by the United States as a military road in those halcyon days known to the south as "long befo de wah." This road was 22 feet wide and runs through a stretch of flat lands covered with a heavy growth of pine and is wet during the rainy season, when long stretches of the road are impassable for heavy vehicles. The commissioners first directed their engineer to lay out a system of drainage, following which deep ditches were dug on either side of the road, some of which were a mile long before they reached a fall. These ditches not only carry away the water from the surface of the

road, but effectually drain it from the foundations. It cannot be too strongly insisted upon that the first requisite of a slag road, as of any other, is a thorough system of drainage; and it is not enough to carry away the water from the surface, but the foundations of the road must be thoroughly drained, as otherwise the road bed will be soft and spongy and whatever covering is put on it will cut down into the soil under the pressure of heavy vehicles; while on the other hand a well drained foundation grows continually stronger under the pressure of heavy traffic, even though the surface has no covering. An illustration of this is seen in the "good roads," for which Jackson County in 1909 issued $13,000 worth of 6 per cent bonds, which roads were constructed without any provision for drainage and at least 85 per cent of the money has proved to have been thrown away.

When the old Mobile road had been drained as described, it was hollowed out by a scarifier and filled in with slag, as in the case of the Laine road described above. This road has now packed down under constant use and is almost as hard and smooth as concrete.

This district does not let out contracts for road construction, but does its own work with its own crew of



TRACTOR AND GRADER BEGINNING WORK.

men. The crew consists of a foreman who receives $75 a month, an engineer for the gasoline tractor at $75 a month, a cook at $35 a month and 5 men at $1.50 to $1.75 a day. A kitchen and a sleeping compartment are rigged upon wheels so as to be moved easily from

GRADING WITH TRACTOR WELL STARTED.

place to place, drawn by mules. The men who board at the camp are charged 50 cents a day for board. During good weather they are worked overtime, for which they receive extra pay; and when the weather is bad they are not allowed to remain idle but are set to work removing stumps, digging ditches and clearing out the right of way, experience having shown that when the men are kept at work during bad weather and earning wages they are more cheerful, and cheerfulness adds 50 to 75 per cent to the workman's efficiency.

Up to November of 1913 the commissioners had no machinery but a grader and a roller, and had to keep a large force of animals on hand, but in that month they purchased from the Galion Iron Works a 40-horsepower Flour City gasoline tractor, and with this machine has graded from 25 to 30 miles of road in one month (this not including cutting out the right of way). The machine uses about ten gallons of gasoline per day. When the soil is not too soft from recent rains, the tractor can be used for pulling up stumps. Where the roads are in good condition it is used for hauling, at which it will do the work of fourteen mules. By the use of this machine the cost of grading roads has been reduced 50

ROAD GRADED, BUT BEFORE SLAG HAS BEEN APPLIED.

COMPLETED SLAG ROAD THROUGH THE PINES.

to 75 per cent., and roads can now be graded by us for from $25 to $35 a mile which formerly cost from $75 to $250.

A chemical analysis of the slag used showed that it consists of the following:

Silica	35.90
Lime	43.40
Alumina	13.38
Magnesia	3.84
Sulphur	1.19

This analysis shows why slag makes good roads, especially when in combination with clay. Clay ordinarily contains about 45 to 60 per cent of silica and from 20 to 30 per cent of alumina, with about 12 per cent of water which is in combination with these materials. It was shown by Smithson at the beginning of the last century that sand or anhydrous silica is an acid, and that the minerals found in rocks are salts of this acid. Alumina, which is the basic principle of clay, is remarkably similar to silica, "and for this reason," says Mendeleeff, "they are capable, like two kindred metals, of entering into many different degrees of combination." The analysis shows that the slag contains calcareous and silica-alumina compounds capable of uniting with water to form hydrates which, when formed, are unacted on by water. When clay, lime and silica or sand are mixed to form cement, the process of hardening is based on the hardening of compounds between the lime, silica, alumina and water, and it is owing to these combinations simultaneously forming in the cement that it gradually grows stronger and stronger.

This enables us to understand why slag roads built upon a clay foundation or mixed with clay are better than those upon sandy soil, since the sand contains an excess of silica, while the clay contains the elements in the right proportion to form a cement when mixed with the slag. The experience of the commissioners is that a clay foundation requires about 58 per cent less slag than a sandy soil.

LIQUID ASPHALT FOR DIRT ROADS.

Liquid asphalt has been used in treating roads in a number of towns in New York and New Jersey for several years past. This material is used not only on macadam and gravel roads but to even a greater extent on ordinary dirt roads. This treatment does not consist in forming a bituminous carpet over the road, as this is understood in Massachusetts for example, where heavy asphalts are applied hot to the road bed and form a distinct bituminous layer of asphalt and stone screenings. With the use of the liquid asphalt as here described, on account of the lightness of the material there is an actual penetration of the oil into the material of the road and the heavier bitumens form a crust which increases in thickness with successive years' applications.

The experience of the town of Islip, Long Island, is typical of the general method. Here Aztec liquid asphalt of about 20° Baume gravity was used. This material is a natural or "straight run" as distinguished from a "cut back" material. Consequently it is composed of hydrocarbons of more nearly uniform density than is a "cut back" material. The town of Islip covers an area of about 100 square miles and has 200 miles of roads. It is both a farming country and a summer resort. Although having a population of 20,000, it includes no large communities, but a number of villages and many miles of streets of a suburban residential character. Some macadam, gravel and shells have been put on the main roads, but a large majority are of the natural soil, which is a sandy loam.

For about eight years the oil treatment has been used. Previous to that the roads had been sprinkled with water by private contract, presumably at a high cost, as at times they required sprinkling five times a day. One treatment of oil a year has been sufficient. Last year about one hundred miles were oiled at a cost of about $8,500. The amount of asphalt used is about one-third gallon per square yard. It was applied by a Studebaker distributor, under power from a pump operated through chains and gears from the wheel. The cost of course

OIL-DIRT ROAD AT SHOREHAM, LONG ISLAND.

varied principally with the distance of the road from the railroad siding where the car of oil was placed. The distributor covers a strip about six feet wide and two laps were made to cover the roadway.

In the course of time, although a crust about an inch in thickness is formed over the road, the general surface may become irregular and have pot holes. Last year a new method of treating roads in this condition was tried and the results were very encouraging and excited the favorable comment of citizens. The old oiled roads were broken up by rooter plows attached to a steam roller, three plows being used at once. The ground was then harrowed, shaped by scraping and rolled with the 10-ton Buffalo-Pitts roller which the town owns. In some cases the earth was scraped off to one side of the road, then back into the center, to insure a uniform bed. Water was also added in some cases. The material was worked up to a depth of six inches. The evidence seems to be unquestionable that the inch or so of bituminous crust, when worked over in this way, acts as a binder of considerable strength and forms a more solid road bed than would be made by the earth alone.

At Shoreham, on the north side of Long Island, a real estate company has applied Aztec liquid asphalt in a different way, embodying the oil with the soil of the road at the first application. This work has been done in two ways; in one, the roadway is plowed and harrowed and oil added to it in this condition, after which it is shaped and rolled. Or a still better method, the dirt is scraped to one side of the road first and the oil added as it is worked back over the road again.

MAINTAINING CONCRETE ROADS*

How Wayne County, Michigan, Keeps Its Roads in Condition—When and How Tar is Used for this Purpose.

By EDWARD N. HINES.†

In Wayne County, Mich., we have followed two methods in maintaining the concrete roads, the first of which consists in filling the open expansion joint on the roads first built before the development and use of the armor joint, and the second the filling with a mastic of such longitudinal and transverse cracks as have developed.

A crew consisting of seven men and a team, provided with a tar kettle, is utilized for the work. The foreman is paid $5 a day, the team and driver $5 a day, the "tar man" $3 a day, two laborers at $2.50 each, and two laborers at $2.25 each. The tools used consist of two wire-bristle brooms, a wheelbarrow, a couple of shovels and a tar bucket with a round spout. Tarvia X is now used exclusively. A lighter grade was first tried out, but did not give such permanent results as the heavier grade. Two men sweep all cracks clean with the wire brooms, after which the man with the tar kettle fills the cracks with the tar, which is heated to about 225° F. An excess of tar is poured in so that it extends an inch or so beyond the edge of the crack. It is then allowed to stand in the crack for a few minutes to prevent it from "bubbling" out in case the sand is wet. The sand, which should be dry and coarse, is spread with a shovel over the crack and into the tar, and the whole is left for traffic to iron out. The excess tar and sand is worn away rapidly, leaving a smooth, even surface, over which no jolt is apparent in passing either with a horse-drawn or motor-driven vehicle. This method of repair prevents the edges of the concrete from spalling and chipping, and no water can get through to the subgrade to freeze and heave in cold weather.

The work is preferably done on hot, dry days. It has been suggested to us that the better time to handle this work would be in the late fall when the cracks would be open the widest, due to contraction, but the results we have secured in the summer months have been so satisfactory that we have not tried out the latter plan. The small pit holes which are due simply to some foreign substance getting into the concrete, like clay, wood, or some fragment of inferior rock which might chance to be a part of the aggregate, are treated in the same manner. As to the cost of this method, the engineering staff, Messrs. George A. Dingman and George F. Key, have presented a report of the repair work done on 51 miles of concrete roads in the fiscal year ending Sept. 20, 1913, showing a total expenditure of $1,300.50 for tar, labor and sand.

A percentage was added to cover engineers, inspectors and the depreciation of machinery and building and other "overhead" charges, totalling approximately $1,450. The greater part of this mileage was treated for the first time. Once a year is often enough to go over the work and touch it up here and there, as we have found by experience that the bulk of the repairs previously made is intact.

We have not had as good success in treating the entire surface of a road where the concrete from any cause has not stood the wear. One-half mile of concrete on Fort Road, built by Porath & Son, about 800 ft. on Grand River Road, built by the Owosso Construction Co., and 1¾ miles on Gratiot Road, out of the 80 odd miles of concrete road in Wayne County, are not up to the standard of the balance of the construction, and they have been surfaced with Dolarway, a special grade of Tarvia and Tarvia X. The surfaces of Fort and Gratiot Roads were both rough, having been built in cold weather and opened for traffic before the concrete had thoroughly hardened. Fort Road was surfaced by the contractor before the Board would accept the road and make the final payment. It carries a fairly heavy mixed traffic, not as great, however, as either Grand River or Gratiot Roads. A special grade of Tarvia was used, furnished by the Barrett Manufacturing Co. The road was first swept by a street sweeper, which was followed by men with wire brooms. About ½ gallon of bitumen to the square yard was used, and the whole covered with coarse sand and rolled with a 10-ton roller. This repair was made early in the summer and was not touched in any manner for a period of two years. By this time it had scaled off in spots quite badly, and was gone over again in the summer of 1913, using Tarvia X and a washed roofing gravel about ¼ inch in size. We have no record of what the first cost was to the contractor, as we paid nothing for it.

Gratiot Road was surfaced at cost to us by the Dolarway people in the spring of 1912. By the summer of 1913 about half of the original coating had scaled off, at which time we patched it up, using a special grade of Tarvia and Tarvia X. The Tarvia X has given the better result to date. Washed roofing gravel was used with the bitumen. This work was also rolled with a 10-ton roller. Gratiot Road carries an average traffic of over 1,000 vehicles a day. (On the last count made one week in August and one week in September the average traffic per day was 1,210, of which 36 per cent was motor traffic and 64 per cent horse-drawn vehicles.) The surface of the road is wavy, and we have found it necessary to go over the work two or three times during the summer, touching up small spots here and there where it has scaled off. The cost of the work done by our Board is in the neighborhood of nine cents per square yard.

*Committee report to the National Conference on Concrete Road Building.
†Chairman of Wayne County Road Board.

ROAD ADMINISTRATION IN THE SEVERAL STATES

Title and Personnel of the State Highway Administrative Organization in Each of the Forty-eight States—County Organizations—Character of Aid Given by the States.

In the statement below will be found the state and local organization provided by each of the forty-eight states for carrying on road work, with the names of the state officials, and their salaries in many cases. There are also described the character of the work done by the state—whether direct or by state aid—and the amounts of state aid given. This has been brought up to date and checked over through the courtesy of Vernon M. Peirce, acting director of the U. S. Office of Public Roads.

State.	Highway administrative organization—State.	Highway administrative organization—Local.	Character and apportionment of State aid.
Alabama	State highway commission of five members. State highway engineer, W. S. Keller; salary, $4,000.	County commissioners.	State appropriates $2,000 annually to each county which gives similar amount; said county must build section of road under direction of state highway department.
Arizona	State board of control, consisting of governor, state auditor and one citizen appointed by governor. State engineer, Lamar Cobb; salary, $3,000.	Board of supervisors. County superintendent of roads.	Tax shall be imposed to yield $250,000; 25 per cent subject to state direction; each county receives back 75 per cent. of amount paid by it.
Arkansas	Department of State Lands, Highways and Improvements. Reuben G. Dye, chairman; H. R. Carter, highway engineer. State highway commission consists of 3 members—commissioner of state lands, highways and improvements, ex officio, and 2 members appointed by the governor.	County judges.	Educational and investigati[illegible].
California	Highway division of state department of engineering. State highway engineer, A. B. Fletcher; salary, $10,000.	Board of county supervisors. Bond issues under special highway commissions.	State only assists in trunk line construction and pays all costs.
Colorado	State highway commission, consisting of five advisory members without salary. J. W. Kuykendall, chairman, T. J. Ehrhart, state highway commissioner, and J. E. Maloney, secretary and engineer.	Board of county commissioners.	All roads receiving state aid under state highway law are state roads; funds are apportioned to counties according to land area, amount of money expended by it in road construction, difficulty of said work, and extra expense connected with development of new country.
Connecticut	State highway commissioner, Charles J. Bennett; salary, $5,000.	Board of selectmen of each town.	State roads are paid for by state. State funds are apportioned on basis of taxable valuation of various towns.
Delaware	State highway commissioner for Newcastle County, James Wilson, Wilmington. State highway commissioner for Kent County, C. B. Hope, Dover.	Levy courts.	An annual appropriation of $10,000 is made to each county.
Florida	No state highway department.	Board of county commissioners.	None. Convicts may be used on roads
Georgia	No state highway department. State Geological Survey, Dr. S. W. McCallie, state geologist. collects data on roads; state prison commission, R. E. Davidson, chairman, has control over state convicts.	Board of county commissioners. Sometimes the ordinary.	Entire state male convict force work roads.
Idaho	State highway commission, consisting of secretary of state, state engineer, head of department of civil engineering of State University and two members appointed by the governor. No salary, but actual expenses. Thomas Turner, chairman.	Board of county commissioners.	General supervision of state or state aid highways.
Illinois	State highway commission, consisting of 3 members. A. D. Gash, chairman; salary, $3,500. A. N. Johnson, highway engineer, salary, $4,000.	Board of county commissioners, county highway engineer and board of township commissioners.	State aid to counties and townships. Crushed stone from state quarries, worked by convict labor, given on application from local road authorities.

State.	Highway administrative organization—State.	Highway administrative organization—Local.	Character and apportionment of State aid.
Indiana	No state highway department.	County commissioners over county roads; township trustees over township roads.	None.
Iowa	State highway department, consisting of 3 members at a salary of $10 per day, while employed. Offices at the State College of Agriculture at Ames. A. Marston, chairman; T. H. MacDonald, highway engineer.	County board of supervisors, county engineers and township trustees.	General supervision of county road system.
Kansas	No state highway department. Extension department of State Agricultural College provides for state engineer; W. S. Gearhart, state engineer, Manhattan; salary, $2,500.	County and state highways under county commissioners; county engineer: mail routes and township roads under township board and county engineer.	Educational and investigative work.
Kentucky	State commissioner of public roads, Robert C. Terrell; salary, $3,000.	County courts and county road engineer of each county.	Educational, supervisory and investigative.
Louisiana	Highway department of board of state engineers; W. E. Atkinson, state highway engineer; salary, $4,000.	Police juries have charge of the roads in parish.	State aid to parishes for construction under direct supervision of highway department.
Maine	State highway commission, consisting of 3 members appointed by the governor; salary, $1,000 and traveling expenses. Lyman H. Nelson, chairman; Paul D. Sargent, chief engineer.	Selectmen have general charge of roads in incorporated towns, while county commissioners supervise those in unincorporated towns.	State roads built at entire cost to state and state aid to towns. Distribution on basis of taxable valuation and amount raised locally.
Maryland	Maryland State Road Commission consists of governor, 2 members of state geological survey and 3 members appointed. Chairman's salary, $2,500: 3 other members, $2,000. Chief engineer, Henry G. Shirley.	Board of county commissioners; some counties have a board of road directors.	State roads built at state expense; in general, apportionment is on basis of road mileage; state aid roads, based on road mileage.
Massachusetts	State highway comission of 3 members appointed by governor. Chairman, W. D. Sohier; salary, $5,000. Other member's salary, $4,000.	Usually board of selectmen in each town.	Law requires work of commission be fairly apportioned among different counties.
Michigan	State highway commissioner, Frank F. Rogers.	County commissioners have charge of roads in certain counties, while township highway commissioners have charge in others.	State reward paid to counties or towns for certain roads constructed, according to standards adopted by the state highway department. Double reward paid on certain trunk line roads.
Minnesota	State highway commission, consisting of 3 members appointed by governor. No pay, except actual traveling expenses. C. D. Babcock, chairman; G. W. Cooley, state engineer.	Board of county commissioners have charge of county roads and township boards have charge of township roads.	State aid apportioned to counties on a sliding scale according to assessed valuation, with the proviso that not less than 1 per cent of the available amount nor more than 3 per cent shall be paid to any county in one year.
Mississippi	No state highway department.	County board of supervisors; bond issues expended by special commission.	None.
Missouri	State highway commissioner, Frank W. Buffum; salary, $3,000.	County court and road engineer in counties having county organization. In others, board of township commissioners control.	Various state funds apportioned to counties as state aid; also state fund to defray expense of constructing inter-county state highways.
Montana	Highway commission, consisting of 3 members, professor of civil engineering Montana Agricultural College, state engineer and civil engineer appointed by the governor. A. W. Mahon, chairman; Geo. R. Metlen, secretary-engineer.	Board of county commissioners control local roads.	Advisory, educational.
Nebraska	Department of irrigation, highways and drainage has supervision over large bridges.	County board of commissioners and township commissioners have supervision over all roads.	State pays one-half of cost of certain bridges having a span of over 175 feet.

State.	Highway administrative organization—State.	Highway administrative organization—Local.	Character and apportionment of State aid.
Nevada	No state highway department; state prison commission details convicts for road work. State engineer, W. M. Kearney.	Board of county commissioners.	State appropriates $20,000 for road fund in equipping and working state convicts on roads; no other appropriation.
New Hampshire	State highway department consists of governor and council and state superintendent of highways, S. Percy Hooker.	Board of selectmen or highway agents elected by the people.	State aid is apportioned on basis of assessed valuation and amount locally raised. In addition to state aid, the governor and council designate for improvement three continuous highways from the Massachusetts line northerly and apportion funds equally to each road.
New Jersey	State road commission consists of governor, speaker of house of representatives, president of senate and commissioner of public roads. State road commissioner, E. H. Stevens; salary, $5,000. State road supervisor, R. A. Meeker; salary, $4,000.	Board of chosen freeholders in each county, who appoint road supervisor and engineer.	No basis for apportionment. Funds shall be distributed among the counties as equitably as possible.
New Mexico	State highway commission, composed of governor, commissioner of public lands and state engineer. Jas. A. French, state engineer.	County commissioners and a county road board appointed by state highway commission.	State aid to counties and appropriations for specific state roads. State convict labor used on state roads.
New York	State commissioner of highways, John N. Carlisle; salary, $10,000 per year.	Board of supervisors for counties; town board and superintendent for townships.	State highways forming a trunk line system are paid for by the state. Basis of apportionment of state aid to counties according to mileage and assessed valuation, outside of cities.
North Carolina	No state highway department. State geologist, Dr. Jos. Hyde Pratt, Chapel Hill; salary, $3,600.	County commissioners for county roads; township commissioners for township roads.	Educational and investigative work. Convict labor is generally used by counties.
North Dakota	State highway commission, consisting of governor, state engineer and one member appointed by the governor. No salary. State engineer and secretary, Jay W. Bliss.	County commissioners for county roads; township commissioners for township roads.	Advisory, educational and investigative.
Ohio	State highway commissioner, James R. Marker; salary, $4,000.	County commissioners for county roads; board of township trustees for township roads.	One mill road tax; one-fourth of which may be used for the construction of a system of state roads. State aid apportioned to counties.
Oklahoma	State highway commissioner, Sidney Suggs; salary, $2,500.	County commissioners for county roads; township board of trustees for township roads.	Educational and investigative work.
Oregon	State highway commission, consisting of governor, secretary of state, state treasurer. H. L. Bowlby, state engineer; salary, $3,000.	County courts in charge of roads of county.	State roads selected with reference to principle market centers of state. May be constructed at entire expense of the state. State convict labor may be used.
Pennsylvania	State highway commissioner, E. M. Bigelow; salary, $8,000.	Township supervisors, who are elected annually.	State aid funds are apportioned among counties according to mileage of township and county roads. State highways built at expense of state are trunk lines connecting county seats and principal cities.
Rhode Island	State board of public roads, consisting of 5 members, Robt. B. Treat, chairman. Engineer's salary, $3,000.	Town council, which forms districts and appoints surveyor of highway for each district.	State roads built at state expense; not more than one-third, nor less than one-seventh of appropriation to be expended in one county. Collection of statistics.
South Carolina	No state highway department. State commissioner of agriculture, E. J. Watson.	Board of county commissioners and county supervisor.	
South Dakota	State highway commission, consisting of 3 members appointed by governor. E. C. Issenhuth, chairman; Homer M. Derr, state engineer.	Board of county commissioners for county roads; township board of supervisors for township roads.	Supervisory, educational and investigative.
Tennessee	State commission of public roads. Three members appointed by governor. No salary. Cyrus Kehr, state highway commissioner.	County court in charge of all roads in county.	Investigative.
Texas	No state highway department.	County commissioners court.	None.

State.	Highway administrative organization—State.	Highway administrative organization—Local.	Character and apportionment of State aid.
Utah	State highway commission consists of governor, state engineer, state treasurer, one member of faculty of Agricultural College and one from the faculty of the University of Utah. No salary. Wm. Spry, chairman; A. R. Morgan, road engineer.	Board of county commissioners and appointive county road commissioners.	State aid is apportioned equally among the several counties.
Vermont	State highway commissioner, Charles W. Gates, Franklin; salary, $2,500.	Board of selectment for each town.	Basis of appropriation is road mileage, determined by selectmen annually.
Virginia	State highway commission consists of professors of civil engineering from University of Virginia, Virginia Military Institute, Virginia Agricultural and Polytechnic Institute, and one other member appointed by governor. Geo. P. Coleman, state highway commissioner; salary, $3,000.	County supervisor in charge of roads of the county.	State aid is apportioned to counties according to taxable valuation of preceding year. Aid in the form of state convicts is also given, but no county may receive cash and labor aid during the same year.
Washington	State highway board consists of governor, state auditor, state treasurer and a member of state railway commission. State highway commissioner, W. R. Roy; salary, $5,000.	County commissioners have charge of the local roads, except in 3 counties, where township system prevails.	State roads selected by legislature. One mill tax is levied for the construction of market roads under state supervision.
West Virginia	State road bureau consists of professor of railway engineering in State University, director of State Experiment Station and 2 members chosen by the governor. A. D. Williams, chairman and chief engineer.	County commissioners have charge of the roads and appoint a county engineer.	Supervisory, educational and investigative.
Wisconsin	State highway commission, 5 members, consists of state geologist, dean of engineering at State University and 3 members appointed by governor. State highway engineer, A. R. Hirst.	Principally township boards; state aid expended by county highway commissioners.	Apportionment is based on state tax levied in preceding year for all state purposes.
Wyoming	No state highway department. State engineer, A. J. Parshall.	County commissioners.	No state aid except convict labor.

STATE HIGHWAY WORK

Methods of Procedure in Several States and Details of Operation Explained by State Officials. Costs—Contemplated Work.

The following explanations have been sent to us by the commissioners or other high officials in charge of road work in the several states, outlining the general laws and practices in force in each:

Kansas.—Our state constitution prohibits the state from doing internal improvement work, so, until the constitution is changed, the state cannot make direct appropriation for highway improvements other than for engineering services.

The work, at the present time, is handled by the county commissioners and the county engineer from township and county funds. This office acts in an advisory capacity or as consulting engineer in most cases. However, we do furnish plans and specifications and act as engineer for a large amount of bridge work and part of the road work where the expense incurred is considerable. The larger part of the road work throughout the state consists simply in grading and dragging of the earth roads, cutting down the hills and constructing and maintaining the bridges. About a dozen counties are now building a considerable amount of macadam and gravel roads.

W. S. Gearhart, State Engineer.

Kentucky.—The state of Kentucky does not at present construct roads or furnish aid to the counties for constructing or repairing roads. The department of public roads of Kentucky acts in an advisory capacity only, and the work as done at present is entirely in the hands of the county officials in each county.

However, the last general assembly passed a state-aid bill of 5 cents per $100 on taxable property, and this fund will become available in 1915.

Robert C. Terrell, Commissioner of Public Roads.

Louisiana.—The state highway department completed, on March 2 of this year, a gravel road 5.8 miles long; and on April 1 it completed 0.82 mile of shell road and two earth roads, one 10.0 and the other 11.0 miles long. Since the first of the year (up to April 13) it has let six contracts, one for 0.85 mile of shell, three for a total of 23.5 miles of gravel, and two for a total of 11.0 miles of earth.

Massachusetts.—We have a few miles of road that have cost $30,000 a mile for grading alone. The cost of a macadam road depends upon the amount of filling necessary, cost of drainage, amount of ledge, whether it needs foundation or not, how near the stone is and what it

costs. It usually costs from six to eight thousand dollars a mile for a macadam road five inches thick and fifteen feet wide, for the macadam alone. Drainage costs from $300 to $1,900 a mile. Grading and foundation cost from $400 to $8,200 a mile.

We are building mostly bituminous macadam now, which adds about fifty cents a square yard to the cost.

Wm. D. Sohier, Chairman Highway Commission.

Michigan.—Michigan does not build any roads, but aids the counties, townships and road districts of the state with "rewards" per mile of twenty-foot road with nine-foot metal as follows: Sand-clay, $250; gravel, $500; stone-gravel, $750; macadam, cement concrete or brick, $1,000; plus ten per cent for each additional foot of metal width up to 16 feet, making the highest reward $1,700 per mile for the ordinary roads of the state.

The law designates certain trunk line roads, which, when constructed according to specifications of the state highway department, draw double the above amounts.

The state highway department designs all bridges and culverts, and constructs and maintains all bridges of more than thirty feet clear span on rewarded trunk line highways.

On December 1st each year the state becomes liable for a repair reward equal to two per cent of all rewards paid prior to that year, and payable upon inspection by the state highway department until the following May 1. Any township failing to qualify for repair reward may be refused rewards on new roads.

The fiscal year of the department ends June 30. The department began work under the reward law July 1, 1905, and has worked four years under Commissioner H. S. Earle, four years under Commissioner T. A. Ely, and is now working under the first of the four years' term of Commissioner Frank F. Rogers. The results of the first eight years are shown in the following table:

Year.	Appropriation.	Reward Paid.	Miles Built.	Average State Aid.
1906.....	$20,000	$13,675	18.00	$759
1907.....	50,000	51,701	64.25	805
1908.....	100,000	71,729	96.50	743
1909.....	150,000	117,021	161.00	726
1910.....	140,000	137,327	204.50	671
1911.....	140,000	193,876	304.25	637
1912.....	235,000	249,671	382.75	652
1913.....	383,500	329,392	523.00	630
Total....	$1,218,500	$1,164,392	1,754.25	$664

A greater percentage of the reward was taken up in the earlier years by the eastern border counties in building stone roads. Later the central and western counties drew the larger percentage with their gravel roads.

There is at this time no provision for the payment of ordinary rewards for fiscal year 1915, the Supreme Court having knocked out the 1913 motor vehicle law which was to have yielded about three-quarters of a million dollars for state rewards in lieu of a specific appropriation.

The trunk line law of 1913 provided $200,000 for 1914 and $300,000 for 1915 for payment of the additional reward on trunk line roads, for building and repairing bridges on trunk line roads, and for expenses incurred on trunk line work. Unless the legislature in special session appropriates a fund for ordinary rewards, the work will be greatly handicapped during 1915, as only half the reward can be paid on trunk line roads and none at all on ordinary roads, and few townships or counties will build roads with the prospect of waiting a year for the reward to be provided by the regular 1915 legislature.

Leroy C. Smith, Deputy State Highway Commissioner.

Missouri.—Exclusive of the work done on the roads in working out the poll tax in the districts, which aggregated several millions of dollars, and in addition to money and labor expended on the two good roads days —August 20 and 21—there was expended during 1913 $4,755,315.82.

Appropriated by County Courts for maintenance	$1,407,216.00
Appropriated by County Courts for new work	506,160.00
State aid from the general road fund	197,324.38
State aid for maintenance of intercounty seat roads	112,500.00
Private donations for road work	387,274.00
Appropriated by road districts	352,739.00
Bridge fund	1,692,102.00

The engineering cost for 1913 on road work was $49,245.15 and on bridge work $26,812.73, a total of $76,057.88.

The number of road overseers was 2,280 and the total amount paid them $444,600, making the total cost of the supervision of Missouri roads last year $520,657.88.

It is expected that there will be no less than six graded highways across the state completed this summer. Most of these will be graded and dragged roads.

One of the possible road achievements is the completion as far west as Jefferson City of the southern cross-state highway from St. Louis to Kansas City.

This department is a new venture in this state, having been created by the recent session of the legislature, and through the fact that we are laboring under the disadvantage of an inadequate appropriation, it is difficult to keep the records of the office in the shape they should be.

F. W. Buffum, State Highway Commissioner.

New York.—Owing to increase in volume and weight of traffic over the state highways it was thought necessary that new specifications be prepared calling for heavier types of roads, and we are hopeful that we now have specifications which will enable us to design roads to meet all the conditions in the state, which will stand the traffic to which they are at present subjected and the future traffic that is sure to come. These new specifications were finally adopted on January 15, 1914.

In a state so diversified as to soil and rock formations as New York no single type of road can be adopted for all localities. Some sections of the state are rich in road-building material and others are woefully deficient. The division engineers who select the types of roads have been instructed to do so only after a most careful study of the soil and natural conditions with particular reference to the road-building material.

The department has commenced and partially finished a geological survey of approximately 7,000 miles of uncompleted portions of the main highway routes. An engineer connected with the Bureau of Tests visited the sections and inspected the available stone and sand. This survey will be completed as soon as possible and when charts have been prepared showing the location of stone, gravel and sand deposits upon these roads, there will be a considerable saving in the cost of construction, as engineers in estimating the cost of material will have on hand accurate information as to the location of the quarries and banks of sand along the roads, the nature of the stone, and the quantity available.

John N. Carlisle, State Commissioner of Highways.

North Dakota.—The state highway commission was created by the 1913 legislative assembly, but was provided with no funds and has done no work. Under the highway laws, in counties having no civil township organization the county board of commissioners act as a highway board; in organized townships the authority is vested in the board of supervisors. In localities where there is unorganized territory the county commissioners may create as many road districts as in their judgment is deemed expedient, and may appoint for each district

an overseer of highways. At the first meeting of the township board, succeeding the annual town meeting, they shall appoint a township overseer of highways, who shall have direct charge of the construction and maintenance of highways and township bridges in the township, whether the work done on same is done by contract or by day labor, and who shall be responsible for the maintenance of said highways throughout the entire year. In unorganized territory the district overseer of highways shall have the same powers and duties as township overseers of highways have in organized townships. In counties having a county superintendent of highways the township road overseer shall be ex-officio deputy county superintendent of highways for his respective township.

In 1911 a law was passed providing that the county commissioners may at their option appoint a county superintendent of highways and deputy superintendents in organized counties, who shall have charge and supervision of the construction, improvement and maintenance of roads within said counties. Up to date only a small per centage of the counties have taken advantage of this law.

A license fee of three dollars per year is required by law for each motor vehicle operated in this state, and the law further provides that the money received for licenses, less the cost of tags and clerical expenses, shall be returned to the county from which it originates, to be used for maintenance and repair of highways. This law was enacted in 1911, and the proceeds returned to the counties during that year amounted to $17,661, during 1912 to $22,800 and during 1913 to 35,006.

In addition to the funds secured by automobile and motorcycle licenses, as stated above, highway maintenance funds are secured by means of poll and property taxes. A poll tax of a dollar and a half is levied on every male person between the ages of twenty-one and fifty years, and a property tax from one to five mills on the dollar may be assessed by the county. The township may levy a maximum highway tax of eight mills on the dollar. A law was passed by the 1913 session of the legislature providing for the cash payment of highway taxes. This law provides, however, that if any taxpayer desires to work upon the roads he shall notify the township overseer of highways of his intention before the first day of May. Such taxpayer shall then be employed on the highways of the township at the time and place which the township overseer or the deputy county superintendent of highways shall designate. Upon certificate of the township overseer that the work has been satisfactorily performed, the board of township supervisors shall issue a warrant therefor.

A concurrent resolution providing that the state may grant aid in highway construction has been passed by the 1911 and 1913 sessions of the legislature. This matter will be submitted to a vote of the people at the next general election, and if it carries laws granting state aid can be passed by the 1915 legislative assembly.

A bill was passed by the 1913 session creating a highway commission, consisting of the governor, the state engineer and one other member to be appointed by the governor. The members of this commission will serve without additional compensation and it shall be their duty to furnish plans and specifications and superintend the construction of any road when requested by the board having jurisdiction over said road, and also to issue bulletins containing advice concerning highway construction and maintenance.

The law also provides that the state engineer shall prepare plans and specifications for any bridge or culvert, or examine and report on any existing bridge or culvert, whenever requested by any board of county commissioners or township supervisors.

Jay W. Bliss, State Engineer.

Pennsylvania.—The actual amount of money expended by the state for improved highways during the year 1913 was as follows: Construction expenses—payments on contracts, $2,128,502.64; surveying and plotting state highway routes and county maps, $227,127.86; maintaining and resurfacing state highways and state-aid highways, $1,919,258.23; machinery and equipment, $292,633.05; signs and sign posts, $1,288.28; general departmental expenses, $37,422.30; total, $4,606,232.36.

The average unit prices have been as follows: Unclassified excavation, 60 cts. per cu. yd.; telford foundation, 8 ins. deep, 58 cts. per sq. yd.; concrete foundation, 5 ins. deep, 75 cts. per sq. yd.; water-bound macadam, 4 ins. deep, 41 cts.; asphaltic macadam (penetration), 3 ins. deep, 79 cts.; asphaltic concrete, 2 ins. deep, $1.04; brick with 1½-inch sand cushion, $1.32.

The outlook for 1914 is not encouraging. Very little remains of the appropriations made by the last legislature. Owing to the stand taken by the auditor general the state highway department has not been able to secure money now in the state treasury received from the taxation of motor vehicles and specifically appropriated to the use of the department by the last legislature. The auditor general has declared that the legislature was without authority in thus appropriating this money and this question is now in the courts, awaiting judicial determination. The following will give the approximate funds available from June 1, 1914, to June 1, 1915:

State Highways, State-aid Highways, National Road (Cumberland Road), and Maintenance Funds	$2,000,000.00
Automobile Division Expenses, Experiments and Tests, Contingent Fund, etc...	300,000.00
Township Road Fund	245,000.00

W. R. D. Hall, Statistician, State Highway Department.

Rhode Island.—There are no state-aid roads in Rhode Island. The entire expense of construction and maintenance of all state roads is borne by the state, and both construction and maintenance are under the direction of this board.

Irving W. Patterson, Engineer, State Board of Public Roads.

North Carolina.—This state does not make a provision for road construction or state aid other than a small annual appropriation of $5,000 to the highway department of the geological survey for giving assistance to counties in road engineering and doing general educational work. The legislature of 1913 made a provision by which a certain number of convicts were allowed to work two sections of road in the mountain counties. The special session of the legislature, which convened in September, 1913, passed an act by which state convicts can be worked on county roads, the county to pay a per diem for each convict.

All the road work done is either by the counties or townships and, in some cases, road districts composed of two or more townships or portions of townships.

Joseph Hyde Pratt, State Geologist.

South Carolina.—This state has no highway commission and this department only does what it is able to do without a state-wide law on the question of public highways. In other words, the authority is very limited, though I have used it more completely perhaps than some of the state highway commissions have done. Under the circumstances, the statistical data is exceedingly difficult to obtain, for the reason that we still have in operation in this state the most obsolete system of county control of public highways, handling all matters

of construction and maintenance. The only thing that is general at all is the law that permits the use of convict labor in the construction of public highways, and, of course, all of this work in the state practically is done with convict labor.

E. J. Watson, Commissioner of Agriculture, Commerce and Industries.

South Dakota.—We do not have state aid for building roads in this state except in this way: The last session of our legislature appropriated $7,500 for each of the years 1913 and 1914, to construct roads along section lines in the state school lands. The amount is entirely inadequate for the purpose and will do only a very small fraction of the amount of work that should be done and for which requests have been made by the people from the various communities. This work is carried out through the direction of the state engineer's office.

The amount levied by the county commissioners for the county road funds to be expended in 1914 totals $561,622. This includes 53 counties, or all but 7 of the total number, and the sum is five times as large as in 1913.

In addition to the above levies by counties, the total of cash and work donated as last year in various communities, and the levies by various townships of every county in the state for road maintenance, together with the auto tax, will, roughly estimated, make up another half million dollars.

Homer M. Derr, State Engineer.

Tennessee.—This state has no state highway department, but the Governor last December appointed a state highway commission for the purpose of collecting and discussing information relating to highway legislation and administration and making recommendations upon these subjects.

At the same time the Tennessee Highway Association was organized. One of its purposes is to prepare highway legislation and present the same to the next general assembly, which will convene next January.

That legislation is to include provision for a state highway department and for other matters which the experience of other states has proven to be desirable. Another purpose of that association is to carry on a campaign of education throughout the state with a view to preparing the people for wise action pertaining to highway matters.

Cyrus Kehr, Chairman of State Highway Commission and Secretary Tennessee Highway Association.

Vermont.—The Vermont road plan is exceedingly simple. It consists in building gravel and gravel-telford roads of a 21-ft. standard. We employ no contractors nor contract labor. We build no long stretches of mileage, but in every town in the state there is yearly made from one to six pieces of the above road from 5 rods in length up to a mile, each piece taking the place of a previous place of sorrow. In this way, we have in the last 10 years made ourselves a system of 4,000 miles of state road that is quite uniformly good. The town is the road unit, and all work is done with town money, the state paying its share at the end upon the acceptance of the road. We have a very small expense of administration, and no regular engineering corps. All engineering services are attached to some particular job and added to its cost. Our roads are more easily maintained than are the other types of roads commonly in vogue.

Charles W. Gates, State Highway Commissioner.

Virginia.—The amount available for 1914 includes $185,000 from the state-aid fund, about $100,000 from the automobile tax, $145,000 for the convict road force and a like amount to be provided by the counties. There are also unexpended bond issues amounting to approximately $1,265,000, of which the greater part will probably be expended during the year.

G. P. Coleman, State Highway Commissioner.

Wyoming.—There is no road work done by the state directly. The state loans convicts to the counties, who work them. The state is prohibited by constitutional provision from engaging in internal improvements. Some few tools have been purchased for the use of the convicts in road work. There are no roads in the state which might be termed anything better than natural. Where the ground is gravelly, the roads could be called gravel. There are no records of the mileage; the data given have been estimated largely from a comparison of county road maps and personal observation.

A. J. Parshall, State Engineer.

APPLIANCES USED ON STATE ROADS

Lists of Those Used in Nine States—Eighteen Hundred Used by One State Department.

It would seem to be difficult, if not impracticable, to obtain a statement of all of the appliances used by state highway commissions and departments on road work for the reason that, while in some cases all of this material is owned by the state, in other cases part is owned by the state and part is furnished by the county or is rented by the season or by the job. The following article, therefore, while it gives a statement of appliances used by a number of state departments, cannot pretend to name all of the appliances used by the state, and in most cases makes no mention of those employed by counties, towns, or other authorities doing road work.

One of the most fully equipped states is that of Illinois. The state highway department reports the following appliances as being used by it: 12 4-horse plows, 6 No. 3 wheel scrapers, 2 4-ton Austin scarifiers, 12 2-horse Austin sprinklers used on macadam roads, a 40-horsepower Buffalo-Pitts tractor for hauling road materials, which hauls 4 8-ton trailers; 11 10-ton road rollers, of which 9 are Kelly and 2 are Iriquois; 2½-cubic yard Koehring concrete mixers used for concrete roads, 6 pressure tanks for distributing tar and oil on bituminous macadam and oil surface work, 7 Honhorst 400-gallon tar kettles, 2 pumps for supplying water for concrete, 12 stone harrows for macadam work, 3 4-horse rooters, and smaller equipment for making repairs.

Massachusetts is even better supplied with apparatus, the department reporting the following: 6 Syracuse road plows, 17 sweepers of various makes and from 7 to 9 feet width, 2 scarifiers, 13 1 and 2-horse graders of Century make and others, 11 1 and 2-horse steel drags, 4 motorcycles, 13 canvas tents, 16 water sprinklers of various makes, 9 automobiles, 24 sand dryers, 3 portable Champion rock crushers, 22 road rollers of 6, 10, 12 and 15 tons, made by the Buffalo Steam Roller Company; 1 1-yard Smith concrete mixer, 21 steel tank oil distributors of various makes, 42 tar kettles of 100 and 400-yard capacity, of various makes, for heating material; 21 tank wagons for oil and tar, 26 steam and gasoline pumps of various makes, 7 portable boilers of Erie make and others, for heating oil and tar, and 4 sand spreaders.

Missouri reports 2 plows, 8 scrapers, 3 graders, 13 drags, 3 dump wagons, 3 concrete mixers and one pump. Details of this apparatus are not given.

Maine reports 2 plows, 2 Buffalo-Pitts scarifiers, one grader, one Studebaker sprinkler, 8 Buffalo-Pitts tractors, with 48 trailers made by the same firm and each carrying 3½ yards, 4 Universal Road Machinery Com-

pany's rock crushers with screens for each, a Buffalo-Pitts road roller and a tar or oil distributor.

Montana reports that each county has more or less machinery, but that the state owns no road machinery. The only specific information furnished is that Flathead County has a Buffalo-Pitts road roller and Silverbow County has a gasoline roller (make not mentioned).

Pennsylvania apparently is well in the lead in the amount of appliances used, reporting the following: 109 plows, 122 scrapers, 25 2-ton scarifiers of Buffalo-Pitts and Austin-Western make, 65 2, 4 and 6-horse graders made by the Austin-Western, Good Roads Machinery and Wheeling M. & F. Companies; 1,200 drags of all types, 123 wagons of all types, a considerable number by the Watson Wagon Company; 44 600-gallon sprinklers of Studebaker and Good Roads Machinery Company make; 11 5-ton auto trucks of White, Alco, Speedwell, Saurer and Pierce-Arrow makes; 20 Good Roads and Symons Gyratory No. 3 and No. 4 rock crushers, each supplied with screens; 41 10-ton road rollers made by the Buffalo-Pitts, Austin-Western and Good Roads Machinery Companies; 3 Ransome concrete mixers, 2 Alco tar or oil distributors, 4 400-gallon tar kettles, made by Iroquois Iron Works; 11 pumps of various sizes, 10 dump carts and 7 steam drills.

SAURER MOTOR TRUCK, REAR DUMP, PENNSYLVANIA STATE HIGHWAY DEPARTMENT.

Rhode Island reports 2 scarifiers, 1 Pillsbury sprinkler; 1 Acme rock crusher, 7 road rollers, 2 6-ton tandem and 5 10-ton three-wheel, manufactured by the Buffalo Steam Roller Company; 6 Austin cube ½-yard concrete mixers, 34 tar kettles of 1 to 3-barrel capacity, both portable and stationary, and one tank wagon.

Wisconsin owns no equipment for use on road work, all machinery of this kind being owned by the counties.

Wyoming reports 3 plows, 9 scrapers and one grader.

A number of purchases of road apparatus which have been made by the various counties from time to time will be found mentioned in the Week's News department of Municipal Journal. For instance, on April 9 it was reported from Ottawa, Kansas, that the county commissioners had recently purchased a Mammoth power grader, 4 Little Giant graders, 4 wheel scrapers, 36 steel road drags, 6 dump scrapers, a road plow and 2 sets of concrete forms. In the same issue we find it reported from Evansville, Wisconsin, that the highway commissioner had just purchased from the Good Roads Machinery Company a stone and gravel crushing machine, and was expecting to order three others at once to be used this summer.

GRAVEL ROADS IN NEW JERSEY

Repairing With Gravel and Broken Stone, Using Tar and Glutrin—Laying Bituminous Top on a Gravel Base.

In Monmouth and Ocean counties, New Jersey, all the new work last year was of gravel. In the former county the repairs consisted of gravel re-surfacing, and in some cases spreading three-quarter inch stone on the existing gravel road and then wetting and thoroughly rolling with a ten-ton steam roller. This method gives very good results. The county has purchased a three-ton scarifier for use on its gravel roads, and it has already proven its efficiency. It was first used on a gravel road that was very wavy, with the result that the waviness was eliminated and much less gravel was required than if the road had not been broken up.

An experimental tar pavement was laid near Hartford Station in 1911 on a gravel base. It softened more or less during the hotter part of last summer and it was found necessary to apply a slight layer of sand to the surface in order to absorb the excess of tar. This piece of road is subjected to exceedingly rough travel, principally truck-wagons that travel practically in one rut. The gravel base has not given away even under these conditions, and with slight repairs this road can easily be kept in fair condition for several years. The bituminous top appears to have water-proofed the base so that it does not soften to any great extent during the winter and early spring.

The experiment made with glutrin during 1911 and 1912 proved sufficiently promising to warrant the application of this material to gravel roads on quite an extensive scale, and the results secured last summer "have demonstrated," says Robert B. Gage, chemist in charge of testing road materials for the state, "that our conclusions based on these experiments were not hasty or incorrectly drawn. There appears to be little doubt but that this material will maintain a gravel road in good condition during the time these roads are subjected to the heavy auto travel. One application per year, however, may not be sufficient to keep these roads hard and dense during the wet seasons. This material is soluble in water, and some of it will naturally leach from a road during the wet seasons and should be replaced in the spring.

"In the application of this material it is very essential that it be applied in several applications in a dilute form. The applications should follow each other as soon as the previous one has penetrated the road until the desired quantity has been applied. It is a mistaken idea to assume that each rain will wash this material farther down into the road. On the contrary, as the road dries the ingredients in the road which have been dissolved by the water are brought to the surface and deposited there when the water evaporates.

"The quantity to be spread per yard depends naturally upon the type of road and the condition of the same. For an ordinary gravel road from ⅜ to ⅝ of a gallon has been found sufficient.

"As yet, the results secured on a macadam road with this material have not been very promising. It has, however, not been applied under conditions which were very favorable to its success. During this season we have applied it to some macadam roads under more favorable conditions than when previously applied. So far it has kept the surfaces of these roads in good condition. Since they have not passed through a winter it is too soon yet to prophesy how long this application

will be able to keep these roads in their present condition."

He concludes that: "Our gravel roads can be maintained in fairly good condition during the greater part of the year, if not during the whole year, at a fairly low cost per mile by the application of a lignin binder and a systematic method of maintenance."

PREPARED FILLER FOR PAVEMENTS.

By ARNOLD KRAEFT, City Engineer of Watertown, Wis.

In preparing specifications in 1912 for a paving job to be done in 1913, my attention was called to a prepared filler for expansion joints. Inquiries addressed and samples received from places where this type of joint had been used convinced me of the advisability of giving the strip filler a tryout, and I specified the same exclusively for a reinforced concrete paving job of 2,700 square yards, which was laid in 1913 on North Eighth street, Dewey avenue, Western avenue and Oconomowoc avenue in Watertown. The experiment proved to be very successful.

The specifications under which bids were received provided that:

Expansion joints shall be provided longitudinally along the outside edge of each gutter and transversely across the pavement at intervals of 25 feet; the latter joints shall always have a width of one-half inch; at street intersections and otherwise, expansion joints shall be arranged as shown in detail on plan. If the concrete slab is more than 18 feet wide, the width of the expansion joints enclosing it shall be three-quarters of one inch; all expansion joints surrounding slabs of a width less than 18 feet shall be one-half inch wide, as shown further on plans. All expansion joints shall extend through the entire thickness of the pavement—that is, 6½ inches deep—and the upper edges of the adjoining concrete shall be rounded neatly to a radius of one-half inch. The expansion joints shall be formed by strips of widths specified above, prepared especially for that purpose, elastic, waterproof and of good wearing quality, like the "Elastite" paving joint manufactured by the Philip Carey Mfg. Co., or any paving joint having similar qualities and equally as useful in the opinion of the Board of Public Works. These strips shall be placed very carefully in straight alignment and in true conformity with the crown specified; they shall be braced carefully to remain perfectly plumb when the adjoining concrete is being deposited. The filler shall present a perfectly smooth surface, free from ridges or depressions at expansion joints. Any sections containing such unevennesses detracting from its appearance and causing water to stand on the pavement, shall be rejected and be rebuilt by the contractor at his own expense.

All material and labor necessary to construct the expansion joints as specified shall be included in the price agreed upon in this contract per square yard of pavement. Provision shall also be made around manholes and other cast iron fixtures within the pavement for an expansion to an extent of one-half inch width, to be filled with strips as above specified.

The Elastite joint was used under the conditions specified above, the width of the roadway averaging 27 feet. The strips came in lengths of 5 feet and could be staked easily and exactly to the required crown. They were shipped in crates and arrived on the job in perfectly straight condition and could be handled easily, the 5-foot sections weighing only about 6 pounds.

The best results were obtained by staking a one-inch board back of the joint, after the latter had been placed in conformity with the required crown; the object of this board being merely to stiffen the strips against loss of alignment. Sufficient concrete was then deposited on both sides of the joint, the board was pulled up and the concrete carefully stamped against the joint. In this way a perfect alignment and good job were secured.

After the concrete had been tamped and struck off finally with a "Roughen's street gauge," the finisher, while floating and trowelling the concrete, pulled up the joint strips by means of small tongs so that the joint would project about one-quarter of an inch above the finished surface of the concrete pavement. He then rounded the edges of the adjoining concrete slightly with a proper edging tool. After the road was thrown open, traffic flattened the projecting part of the joint, thus protecting the edges of the adjoining concrete. Careful observation has shown that the jointing material was sufficiently compressible to fulfill its purpose as an expansion joint filler, and that no noticeable wear to the concrete at the adjoining edges took place where construction was carried out properly as outlined above.

MOTOR VEHICLE TRAFFIC.

Commissioner of public roads E. A. Stevens, of New Jersey, believes that that state is required to provide for a heavier automobile traffic on its roads than is any other state. In his report for 1913 he makes the following comparison of the motor vehicle registration per mile of road in each of several of the most thickly settled states:

State	Miles of Road	Registration	Motor Vehicles Per Mile of Road
Connecticut	15,000	22,124	1.5
Maryland	15,595	15,895	1.0
Massachusetts	23,000	61,859	2.7
New York	120,000	140,000	1.2
Ohio	89,000	85,000	.95
New Jersey	15,000	49,500	3.3

CONTRACTORS' BONDS AND LIENS.

Under the statutes of Massachusetts officers or agents who contract in behalf of the commonwealth for the construction or repair of public buildings or other public works are required to obtain sufficient security, by bond or otherwise, for payment by the contractor for labor performed or materials furnished and used in such construction or repair; but in order to obtain the benefit of such security the claimant is required to file with such officers or agents a sworn statement of his claim within sixty days after the completion of the work.

It has been the practice of the commission in all state highway contracts with private contractors to require a bond in a sum aggregate to one-third of the total amount of the contract.

The statutes of the state of Illinois require a contractor on road work to furnish a bond equal to twice the amount of the contract. While this is not, we believe, especially intended to protect those furnishing labor and material to the contractor, it usually acts to insure payment to laborers and to dealers furnishing materials to the contractor for the work.

Rhode Island has no state law by which the state can be attached for debts or otherwise. In the new state highway specifications there is a provision that no contractor shall be paid in full until all just claims against him have been paid in full.

South Dakota has no provision in the state laws requiring contractors to make deposits or furnish bonds to insure payment for labor and materials, but it has been the practice of the highway commission to require a bond of 20 per cent of the contract price to secure such payment as well as the proper execution of the work.

Virginia also has no provision in the state law covering this point, nor are there any provisions embodied in the state road contracts which require a contractor to make a deposit or furnish bond to insure payment for labor and material used on the state work.

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APRIL 30, 1914.

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Importance of Road Maintenance.

A community which can not afford to maintain a high class road continuously in good condition can not afford to build one.

This in substance is the opinion of M. O. Eldridge, of the U. S. Office of Public Roads, in the leading article of this issue. We wish to endorse this to the fullest extent. We would even go further and say that no community should build improved roads until it has learned to maintain what it already has.

A well-maintained dirt road is generally more satisfactory than a neglected macadam a few years old, and much cheaper. More permanent good and less self-deception would result from beginning a "good roads" movement with the proper maintenance of the roads we have, and proceeding more slowly to the construction of new or improvement of old roads, benefiting in the construction and maintenance of the new by the experience gained in keeping up the old.

Where, as is done in New Hampshire, as much attention is given to the location, drainage and cross-section and the surface treatment of a dirt road as is lavished upon more expensive construction, it will be found that in many locations such a road is good enough for most purposes, and in 350 days out of the year would be preferred by all drivers and horses, and not found objectionable by automobilists.

Because we are persuaded of the importance of this maintenance question; that the greatest economy and efficiency of state road work demands at the present time that interest be largely centered upon maintenance rather than upon construction, and that road officials should devote as much attention to learning about the proper maintenance of roads as they now do to the proper construction of them, we have devoted a large part of this issue to the consideration of maintenance, giving the ideas on this subject of many of the more experienced state road officials and experts. These officials make it evident that maintenance requires greater skill than does construction; that it must be done methodically and scientifically, with the use of materials wisely selected for the purpose, and that proper apparatus is as necessary and plays as important a part.

An excellent illustration, especially of the last statement, is the state of Pennsylvania, which reports the use by the highway department on maintenance work of 1,797 pieces of apparatus, from drags to road rollers. This is after less than two years of operation, and shows that this state, at least, is not neglecting this most important branch of road work.

Highway Work in This Issue.

In the tables and articles appearing in this issue, we have endeavored to give a fairly complete idea of the highway work being done in this country by the several States, and also the views of a number of the more experienced highway commissioners and experts concerning the best methods of maintaining roads of all kinds, from the original soil to the most expensive and durable. Brick alone, we believe, has not been included, for the reason that there is little or no maintenance work to be done to a brick pavement until it is so worn out as to need renewal.

We have paid more attention to earth and gravel roads than some, perhaps, might think their importance warranted, but our reasons for this are suggested by the preceding editorial and by the tables, which indicate that a very considerable part of the work done last year came under the heads of earth, sand-clay and gravel. Too many engineers and superintendents entertain the idea that a dirt or gravel road is such a cheap affair that little attention and money should be wasted upon it; but we have endeavored to show by the opinions of experienced men and by illustrations of the fallacy of this.

Next in interest probably is the treatment of bituminous macadam and bituminous concrete, not because these are more numerous than water-bound macadam, but because the proper treatment of them is less understood and seems to be more difficult. The opinions of several experts on this class of work will be found in this issue.

Not the least interesting, probably, will be the description of the appliances available for State road work. Under one heading will be found grouped lists of the appliances owned and used by each of the several States; under another head is given a list of those which are desirable for maintaining bituminous roads, while in the department of Municipal Appliances will be found a review of new appliances or improvements to old ones which have been brought out during the past year.

Not only have we endeavored to cover maintenance classified by the kind of road, but we have presented descriptions by State officials of the general methods employed in road maintenance in each of quite a number of the States, this including in many cases the costs and also the systems.

STATE HIGHWAY STATISTICS

From All States Having Highway Officials or Furnishing State Aid—Total Amount of Improved Roads in Use, Constructed During 1913, and Contemplated for 1914—Cost of Construction.

TABLE NO. 1.—MILES OF IMPROVED ROADS IN USE IN THE STATES JANUARY 1, 1913.

State.	Earth.	Sand-clay.	Gravel.	Water-bound macadam.	Bituminous macadam.	Bituminous concrete.	Cement concrete.	Concrete, bituminous top.	Brick.	Miscellaneous.
Alabama	.....	.....	.....	.....	.....	....	....	....	....	4,734g
Arizona	139.5	.....	.....	.....	.....	....	....	....	....	.....
Arkansas	Highway department established in 1913.			No data yet.						
Colorado	30,000i	.....	.....	.....	.....	....	....	....	....	350k
Connecticut	Data not yet compiled.									
Delaware	.....	.....	.....	.....	.....	....	....	....	....	180k
Georgia	No road statistics collected.									
Idaho	5,000i	25	.....	38	.....	....	....	....	....	.....
Illinois	86,000	.....	5,000	4,000	50	....	50	....	50	.....
Iowa	102,000i	.....	.....	500	.....	....	3	....	....	.....
Maine m	650.79n	.....	.....	36.03	19.92	....	10.00	....	....	2.9
Massachusetts	72.19	0.24	340.73	187.82	827.23	5.82	3.65	0.90	0.44	40.74c
Michigan	.....	38.981	1092.105	518.111	.....	....	47.338	....	....	57.738d
Missouri	117,634	570	3,420	1,517	650	....	....	....	....	342
Montana	70,000	.....	e	.....	.....	....	....	....	....	.....
New Hampshire	67.75	.....	521.50	150.83	.....	....	....	....	....	.....
New Jersey	.....	.....	5,575,618	8,921,173	785,810	814,643	....	10,513	....	156.494a
New York	.....	.....	156	1,893	1,100	2.6	....	54.	24.	31.3b
North Carolina	.....	700	65	50	.....	....	....	....	....	.....
Ohio	.....	.....	.....	.....	.....	....	....	....	....	24,533g
Oklahoma	499	.....	.....	.....	.....	....	....	....	....	.....
Oregon	33,000i	.....	3,214	871	.....	....	....	....	....	211o
Pennsylvania	.....	.....	.....	.....	.....	....	....	....	....	86,690g
Rhode Island	.....	.....	.....	235.77	88.65	....	....	....	....	.....
South Carolina	16,341	4,519	276	58	.....	....	....	....	....	.....
South Dakota	32,000	.....	.....	.....	.....	....	....	....	....	1,000k
Vermont	.....	.....	15,000	.....	.....	....	....	....	....	.....
Virginia	1,001.49 l	.....	371.29 l	679.41 l	.....	....	....	....	....	8.85a
Wisconsin	223	.....	54	163	.....	....	10	....	....	18k
Wyoming	11,000	1,000	1,000	.....	.....	....	....	....	....	.....

a—Oyster shells. b—21.5 miles rock asphalt, 4.8 of Rocmac, and 5.0 miles of sheet asphalt. c—22.56 miles of sand and oil layer; 0.04 of sand and tar layer; 16.78 of sand and oil mixed; 0.66 of sand and tar mixed, and 0.70 of granite block on concrete foundation. d—38.903 miles of stone-gravel, and 18.0835 of gravel-stone. e—A great many miles of gravel in use, but no data available. f—Quantities for New Jersey are in square yards. g—Different kinds not given. h—Shale. i—Includes unimproved roads. k—"Hard surface." l—Constructed since 1906. m—Built by state aid since 1908. n—Includes gravel. o—Plank road.

TABLE NO. 2.—ROADS CONSTRUCTED BY STATE HIGHWAY OFFICIALS IN 1913.

Miles of Roads and Cost Per Mile.

State.	Earth.		Sand-clay.		Gravel.		Water-bound macadam.		Bituminous macadam.		Bituminous concrete.		Cement concrete.	
	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	Miles.	Cost	Miles.	Cost.
Arizona	80.5	$1,244	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....
Connecticut	Report not yet completed.													
Idaho	Report not received.													
Illinois	.....	.....	....	.....	....	.....	35.8	.....	1.	.....	....	.....	7.5	.....
Maine	1.64	$3,414	....	.....	39.22	$3,414	.58	$8,446	6.05	$11,528	....	.....	10.89	$15,364
Maryland	.....	.....	....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....	.....
Massachusetts	23.31	.....	....	.....	73.54	.....	10.53	.....	63.10	.....	....	.....	2.54	.....
Montana	45	22,500	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....
New Mexico	.....	.....	....	.....	56	.....	....	.....	....	.....	....	.....	....	.....
New York	.....	.....	....	.....	....	.....	11.3	12,712	....	.....	6.0	$45,667	....	.....
Pennsylvania	.....	.....	....	.....	....	.....	7.64	.....	24.37	.....	17.98	.....	....	.....
Rhode Island	.....	.....	....	.....	....	.....	19.74	.....	3.7	.....	....	.....	....	.....
South Dakota	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....

Concrete, bituminous top.		Brick.		Other kinds.		Total spent by state.
Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	
....	.....	....	.....	....	.....	$274,631
....	.....	....	.....	9.0a	$130,751b	$100,000
....	.....	....	.....	0.10	.....	750,676
....	.....	....	.....	202.54f	8,286	.....
....	.....	....	.....	9.54d	.....	1,373,263
....	.....	....	.....	....	.....	.....
....	.....	....	.....	....	.....	.....
118.6	$13,173	60.	$21,918	10.4e	23,211	.....
....	.....	14.74	.....	....	.....	4,606,232
....	.....	....	.....	....	.....	.....
....	.....	....	.....	3,000f	.....	.....

a—Oil surface on macadam. b—Total cost of all kinds. c—Petrolithic. d—2.05 miles of gravel with cold oil blanket, 2.16 of sand and oil layer, 4.63 of sand and oil mixed, and 0.70 of granite block on concrete foundation. e—5.2 miles of Rocmac and the same of asphalt pavement; the former costing $110,400, the latter $131,000. f—Kinds not given.

ROAD WORK CONTEMPLATED FOR 1914.

A number of the states have reported more or less definitely concerning the amount of work which they expect to do during the present year, some giving merely the total amount of money available, while others indicate the probable amount of each kind of road which will be built. Colorado reports $250,000 available. Delaware expects to build about 15 miles of macadam. Illinois has $800,000 available, and expects to build about 125 miles of cement concrete and 25 miles of brick pavements. Louisiana expects to spend about $130,000 of state funds. Maine expects to build about 15 miles of earth roads, 200 miles of gravel, 30 miles of bituminous macadam and 5 miles of cement concrete. Maryland expects to spend $3,000,000; Michigan, about $486,000; Minnesota, $1,400,000 state aid and $1,874,000 county fund expended under direction of state department; Missouri, $350,000; Montana, $2,000,000; New Hampshire, $284,229, for which it expects to build about 125 miles, probably largely gravel; New Mexico, about $120,000; Oregon, $240,000; Pennsylvania, $2,545,000; Vermont, $415,000 for about 225 miles of gravel roads; Virginia, $1,695,000; West Virginia has available a total of nearly $4,000,000, and expects to spend this year about $150,000 on earth, $509,000 on waterbound macadam, $130,000 on cement concrete and $800,000 on brick. Wisconsin has $4,450,000 available, and expects to build this year about 600 miles of earth roads, 400 of gravel, 400 of waterbound macadam, 30 of cement concrete and 100 of shale. Alabama will have $350,000 available; Arizona, $258,577.

TABLE NO. 3.—ROADS CONSTRUCTED BY STATE AID IN 1913.

Miles of Roads and Cost Per Mile.

State.	Earth.		Sand-clay.		Gravel.		Water-bound macadam.		Bituminous macadam.		Bituminous concrete.		Cement concrete.		Concrete, bituminous top.		Brick.		Other kinds.		Total spent by state.
	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	Miles.	Cost	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	Miles.	Cost.	
Alabama	31.81	$1,200	44.72	$1,500	24.02	$2,500	7.00	$4,000	....	.....	....	.....	....	.....	....	.....	....	.....	21.53	.....	.....
Arkansas	State Highway Department created last year.																				
Colorado	2,416	290	132	273	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	500,000
Delaware	No figures received.																				
Illinois	73.8	.....	....	.....	30.0	.....	60	4,000	....	.....	....	.....	....	.....	....	.....	....	.....	9.5c	.....	400,000
Louisiana	7.62	$3,317	0.31	$2,772	95.62	3,123	4.20	7,426	1.06	$14,540	....	.....	0.95	$23,149	....	.....	....	.....	0.09e	$85,800	.....
Maine	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	18.15d	.....	.....
Maryland	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	524d	.....	365,569
Michigan	584.03	.....	11.4	.....	216.95	.....	6.84	.....	....	.....	....	.....	6.29	.....	....	.....	....	.....	....	.....	.....
Minnesota	1,663.6f	419	358.03f	151	490.2f	439	12.76f	2,080	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	309,824
Missouri	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	.....
Montana b	12.52	1,786	....	.....	101.17	3,807	17.78	7,102	23.85	.....	....	.....	....	.....	0.69	.....	....	.....	....	.....	313,128
New Hampshire	.....	.....	....	.....	....	.....	14.51	.....	.....	.....	34.82	.....	....	.....	....	.....	....	.....	....	.....	971,257
New Jersey	.....	.....	....	.....	56	.....	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	.....
New Mexico	500	.....	700	.....	65	.....	50	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	.....
North Carolina b	.....	.....	....	.....	....	.....	106.01	.....	....	.....	....	.....	22.30	.....	....	.....	29.30	.....	....	.....	1,386,505
Ohio	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	.....
Oregon b	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	.....
Utah	No report received.																				
Vermont	.....	.....	....	.....	225	2,222	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	490,000
Virginia	73.72	2,503	270.35	883	98.65	1,504	169.65	5,028	.65	14,328	....	.....	.05	12,346	....	.....	.42	42,076	6.34	5,814	1,487,782
Washington	No report received.																				
Wisconsin	460	.....	....	.....	150	.....	290	.....	....	.....	....	.....	....	.....	26	.....	....	.....	.65a	.....	2,150,000
Wyoming b	.....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	....	.....	.....

a—Shale. b—Work done with state and county convicts. c—Petrolithic. d—Kinds not stated. e—Wood block. f—Supervised by state department.

MAINTAINING BITUMINOUS PAVEMENTS

Patching and Covering, Re-treating and Re-surfacing of Bituminous Surfaces and Pavements—Seal Coats—Appliances Needed.

A discussion was held, a few weeks ago, largely by correspondence, among various members of the American Society of Civil Engineers concerning the construction and maintenance of roads, and the parties entering into the discussion are so generally recognized as experts on the subject, and the subject was so fully covered that a synopsis of this discussion would seem to be of especial value.

The principal and leading part was taken by William R. Farrington, Division Engineer of the Massachusetts Highway Commission; the others taking part being H. B. Pullar, Professor A. H. Blanchard, W. H. Fulweiler and James H. Sturdevant. In general the statements are those made by Mr. Farrington, other opinions being given in the names of the parties expressing them.

Maintenance of bituminous surfaces and bituminous pavements may be divided into three stages; the first being ordinary maintenance, such as patching, covering, etc.; the second, a retreatment of the surfaces and renewal of the seal coats; and the third, a reshaping and resurfacing of roadways carrying bituminous surfaces and even the reconstruction of the pavements. It is assumed that the work will be handled by a department with its own gangs and equipment, rather than by contract, except possibly in case of extensive resurfacing.

PATCHING AND COVERING.

For patching, only a small gang is needed, and the equipment is simple. There should be one or two portable melting kettles, a small portable tool house, and one or two small tents for the laborers, unless a van is provided.

Generally, the same kind of bituminous material should be used for patching as was used in forming the surface, and ordinarily it is not advisable to select a much heavier grade, except with stone, slag or chips, for filling depressions. Only the lightest or so-called dust-laying oils or tars should be used where no grit is to be added; and, even with these, a light covering is probably economical. Patching without covering is usually not advisable, as the cost of an additional application is small. Prof. Blanchard agrees that the same type and grade of bituminous material should be used as in original construction, adding that: "Continuous maintenance should be conducted so that the highway may be at once opened to traffic without injury resulting to the repaired sections. For the repair of potholes, ruts, and other holes or depressions, this implies the use of bituminous materials of much lower penetration than have ordinarily been used in many cases."

Bituminous Surfaces.—In patching an ordinary oil or tar surface slight depressions should first be filled with oil or tar, and sand, gravel or chips; but if they are deep, stone or slag should be added. The depressions should be cleaned and the edges cut out if necessary, in order to allow a thorough bonding of the new and old material.

Although the best results are obtained by mixing the bituminous material and sand or stone before applying, satisfactory results may be obtained without mixing, if the work is done carefully. In filling slight depressions without mixing, a thin coating of oil or tar is spread over the bottom and covered with sand, gravel or chips. If stone or slag is used, it is spread over the oil and more oil is applied, and this in turn covered with grit.

After filling the depressions, any places where the bitu-

minous surface is practically worn through should be coated, the surface first being cleaned, and grit should be spread over the oil or tar. In no case should much more than one-half gallon of bituminous material per square yard be used for coating the surface, as any surplus oil or tar will result eventually in the rolling of the surface and the formation of bunches.

Most of the so-called cold tars may be applied without heating, as may the lighter grades of the so-called cold oils or road oils; but the heavier grades must be heated in order to give the best results in patching. A much heavier oil or tar than that used in the surface is inadvisable for patching, yet a somewhat lighter grade may be used. Excellent results are obtained by patching a hot oil or tar blanket with the heaviest cold oil or tar, and with these there is much less chance for the formation of bunches than with the heavier materials. (On this subject, see the discussion on maintenance of New Hampshire roads on another page.)

Bituminous Pavements.—In patching bituminous pavements, including those composed of sand and oil, the methods are similar to those just described, except that the depressions should be filled with heavy oil and sand properly heated and mixed before applying; or, if the heavy oil is not available or there are no facilities for heating the sand, an oil similar to that used for surface work will give good results with slag or cinders, without mixing.

On any bituminous surface and especially one in the formation of which oil is used, more or less covering with sand, gravel or chips will be required, either to take up free oil or tar (which will work to the surface for some time after it is applied) or later to prevent the picking up of the surface, which may soften under certain conditions. Covering is also partly a remedy for the slippery condition incidental to any bituminous surface during cold weather.

Said Mr. Fulweiler: "It is not economical to apply a bituminous material without some covering, as the greatest value of the treatment lies in the added strength given to the surface of the road by the mineral aggregate used as a covering, which the bituminous material merely serves to protect and retain in position." He considered it very important that the edge of a patch be cut back, both to form a square edge and to remove the material at the edge of the depression, which is invariably partly disintegrated. He also agreed that excellent results may be obtained by using bituminous materials which may be applied without heating, thus removing a serious difficulty to making numerous small patches; also because they may be applied during all seasons and are much less affected by the dust and moisture in the road surface.

Mr. Sturdevant also approved of using previously mixed materials which can be kept for months ready for application, he having used some nearly a year old. He cautioned against using too much asphaltic material in patching ruts or holes and had found it well not to have the patch flush with the surface, for the sun would soften it, the asphalt would come to the surface and should then be covered with more stone and a hump will develop unless the patch was originally a little low. This is less likely to occur if the material used in patching has been mixed before applying. A properly made patch will last much longer than the original surface.

RE-TREATMENT.

Where conditions are favorable to bituminous surfaces and the travel, especially the horse-drawn travel, is not too heavy, a bituminous surface consisting of grit and about one-half gallon per square yard of the heaviest hot oil suitable for blanket work should last from three to five years without re-treatment, if patched occasionally and otherwise maintained properly. In re-treating such a surface, not more than one-quarter gallon of oil per square yard should be used, unless practically all the original surface is gone; and it is not economical to delay re-treatment until this point is reached, as without the protection of the bituminous surface the road metal will tend to ravel and the roadway to disintegrate. If only one-sixth to one-fourth gallon of light oil per square yard has been used, with a small quantity of covering, the surface will last at best not more than one season, and will probably need to be covered over quite heavily in the fall as well as in the spring. Where three-eighths to one-half gallon per square yard of the heaviest cold oil is used with grit, re-treatment with about the same quantity of oil will usually be necessary the second year, but after that one-sixth to one-third gallon per season should be sufficient. If refined coal gas tar is used, about one-half gallon is required during the first and second seasons. After that, with cold tar, a one-fourth to one-third gallon application will usually be necessary each season; or with hot tar a one-fourth to one-half gallon application should be made every second year. If unrefined water gas tar is used, two three-eighth gallon applications are advisable each year; if only one one-half gallon application is made, considerable patching will probably be required.

Mr. Fulweiler found that ½ gallon of bituminous material should be used in re-treatment, preferably ¼ gallon at first with just sufficient covering to prevent sticking to wheels, then another ¼ gallon with the stone used for covering. "Where such a large quantity of material (½ gallon) is used in re-treatment work, it is advantageous to use stone of a large size; in fact, the writer's best results have been obtained with a size commercially known as ¾-inch." Where an initial application of ½ gallon has been made, he has found that, under favorable conditions, only patching is necessary the second season, about 1-3 gallon the third season, followed by ¼-gallon; or even only 1-3-gallon every other season, under some conditions.

Mr. Sturdevant said that, while the lighter oils were generally used for re-treatment, if used in excess they are not heavy enough to sustain the weight of traffic and ruts are sure to result. To avoid this the oil should be applied uniformly, just enough to cover the surface, and covered. It should then be watched closely, especially in warm weather, and as soon as oil appears through the surface more covering should be added.

Before beginning work the sand or other covering should be piled alongside of the road. Before commencing to distribute the bituminous material, the surface should be cleaned with a horse sweeper, and with hand brooms if necessary. Any depressions should be filled and the surface patched as needed. Where the heavier grades of oil or tar are used, it is well to water the old surface before distributing the new bituminous material, but watering is not necessary with the lighter grades unless the surface is unusually dry. It is advisable to cover the bituminous material lightly at first, applying more grit as needed; for though some bituminous material will take up only enough grit to form a good mixture, without reference to the quantity put on, with others, if there is surplus covering, the oil or tar will continue to work up until the mixture has so weakened that the best results cannot be obtained.

Mr. Fulweiler, however, did not believe in covering lightly at first, but said that it is very easy, after a little experience, to estimate the proper quantity, and better results are obtained by putting on this correct quantity im-

mediately, as it saves trouble, slipperiness and annoyance to traffic, and prevents the formation of spots where the surface would pick up if the covering were too thin.

Seal Coats.—Although a seal coat or wearing coat may not in all cases be necessary on pavements composed of broken stone and bituminous material, it is believed to be economical and should usually be applied either during construction or later, except possibly where asphalt is used in the pavement. The methods of applying or renewing such coats are similar to those for the re-treatment of the surface; but, unless asphalt was used, the bituminous material should be of a lighter grade than that incorporated in the pavement. Oil may be used with good results on a tar pavement; it is less slippery than tar and also acts to some extent as a dust absorbent.

RE-SHAPING OR RE-SURFACING BITUMINOUS SURFACES.

The gradual wear of the road metal and the formation of uneven spots in the surface caused by repeated patching will ultimately necessitate reshaping or resurfacing of the roadway. When this stage is reached, it is well to consider whether an increased amount or changed character of the traffic would make a more permanent form of pavement more economical or otherwise desirable. If it is decided to continue the original type of pavement, the old surface should first be thoroughly broken up with roller picks or a scarifier and removed with stone forks, and the breaking up completed with a straight-tooth harrow, which tends to shake the worn-out material to the bottom. This should be followed by a spring-tooth harrow which, because of the curved teeth, will bring the stone or larger particles of road metal to the top. The surface should be shaped with rakes, any new stone or other road metal needed should be put on, and the road then watered and thoroughly rolled. If any considerable quantity of new stone is used, the voids should be partly filled with sand, stone screenings or chips; but if only a small quantity of new road metal is put on there will usually be sufficient fine material in the road to bond it.

Either a macadam binder or the heaviest road oil may be used, but the former will ordinarily give the best results. About one-half gallon of oil per square yard should be used in two applications, with a covering of grit after each. Ordinarily it is not advisable to use tar for such resurfacing, unless a bituminous pavement is to be formed by penetration, in which case some new stone or other road metal is usually needed, and the voids for about two inches below the surface should not be filled with fine material. For grouting, one-fourth gallon of heavy tar should be used, and a seal coat should be formed by the application of about one-half gallon of lighter tar with grit; or, if preferred, asphalt may be used instead of tar.

The above does not necessarily apply to unscreened gravel; but though the methods of handling this material are somewhat different, and for the first application a fairly light grade of bituminous material should be used, which will penetrate somewhat below the road surface and thus form a real bond between the bituminous material and the gravel, heavier grades of oil or tar may be used with good results for later treatment. (Mr. Fulweiler would apply the heavier oil as soon as the lighter has been absorbed into the surface.)

APPLIANCES NEEDED.

The appliances needed for patching are one or two portable melting kettles, a small portable tool house and one or two small tents for the laborers, unless a van is provided. For re-treating a bituminous surface, practically the same apparatus is required. For handling the lighter grades of bituminous materials, one or two distributor carts and a pump for transferring these materials from the tank cars are required. For handling the heaviest grades of oil or tar used for surface work, there should be a 10-ton or 12-ton steam roller, a portable heating boiler, a steam pump, two steel tank wagons, one pressure distributor (if mounted separately, or two if attached to the tank wagons), one or two watering carts, one 2-horse sweeper, one portable tool house, and two large tents or vans for the laborers.

As to the distributors for handling the road oils or the corresponding grades of tars, a gravity machine may be used with good results if the bituminous material is broomed in after it is applied; but the cost of distribution will be less and the results more satisfactory if a pressure distributor is used. For this work, a distributor cart with a pump mounted on a frame back of the tank and connected by a chain with a large sprocket belted to one of the rear wheels is most satisfactory. Under favorable conditions, good results have been obtained with gravity machines in distributing even the heaviest grades of bituminous materials for surface work, but the chances of failure if the conditions are not favorable are such that they should always be applied by pressure distributors if possible. The distributor just described, or one with a gas engine pump mounted either on the tank wagon or on separate gear, may be used, but one operated by steam will give the best results, one advantage of the steam distributor being the possibility of cleaning out the pipes and nozzles by blowing steam through them. Of the steam distributors, there seems to be little choice between the one using the direct pressure of steam in the tank for distributing and the pump type, each having its advantages.

For re-shaping or re-surfacing bituminous surfaces, the equipment needed is the same as that for re-treatment, except that two steam rollers will be needed, also a straight-tooth and a spring-tooth harrow. If stone is to be crushed, there should be a portable crushing outfit, also a scarifier, unless the old surface is broken up with roller picks.

In addition to the above, there will, of course, in each case be furnished the necessary hand tools required for handling stone, sand, etc., brooms for cleaning the old surface and spreading oil, carts for hauling, etc.

The proper care and upkeep of the outfit demands that there should be a suitable storage place at headquarters, with sufficient equipment and proper faciliites for making asphalt repairs. It is not only advantageous to have the repairs made by or under the supervision of those responsible for the apparatus during the working season, but, by having the work done by men from the regular force, it is possible to keep the most competent men busy during the winter.

If the amount of work done warrants the employment of a storekeeper, there should be kept at all times, at the storage place, a sufficient stock of tools, etc., to supply the needs of all the gangs.

Mr. Blanchard recommended for economically and efficiently accomplishing continuous maintenance, a flying squadron, operated under the direction of an engineer in charge of the construction and maintenance of a given territory. This gang could not only make repairs of all kinds, but might even repaint guard rails and attend to other details of maintenance. He recommends the use of a motor truck, to carry a rotary heater and pug mill mixer, 2 heating tanks, a surface heater, storage tanks and barrels for bituminous materials.

The WEEK'S NEWS

Providence's Inspection of Wood Block Pavements Satisfactory—Paterson (N. J.) Must Pay Over Million for Sewers—Cincinnati Tests New 19,000,000-Gallon Pump—Denison (Ia.) Faces Problem in Light Plant Purchase—Purchasing Agent in Birmingham Saves $35,000 Yearly—Electricity from Garbage Incinerator in Milwaukee Fails—Oakland's Proposed Municipal Auditorium.

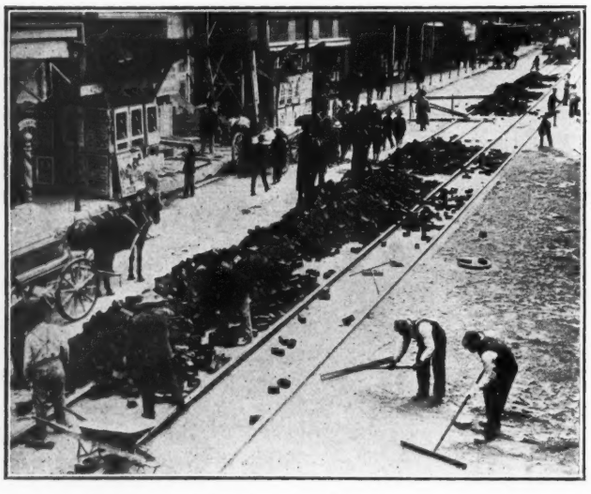
ROADS AND PAVEMENTS

Defer Action on Hudson Bridge Project.

Jersey City, N. J.—The Hudson County Freeholders did not take up the subject of the proposed Hudson river bridge or a vehicular tunnel. Under the Egan Act, signed by Gov. Fielder, the Hudson county board may join with two other counties in asking the governor to appoint a state commission to take the necessary steps in the project. The construction work would be shared equally by New York and New Jersey, the latter's half of the expenses being provided by the three counties going into the enterprise. A bridge, it is thought, would be more acceptable to the counties in New Jersey. The lack of decisive action on the part of the New Jersey counties is due to the failure of the New York state legislature to pass at its last session a bill similar in purpose to the Egan bill. Such a bill may be passed next winter.

San Antonio Street Paved With Wood Block.

San Antonio, Tex.—From time to time Municipal Journal has published news items showing the big bond issues floated in Texas for highway improvements. Among the



Courtesy San Antonio Express.
PAVING HOUSTON STREET WITH WOOD BLOCKS.

larger cities of that state, San Antonio ranks among the first in the street improvements undertaken. A few weeks ago, San Antonio ordered ten carloads of creosoted pine blocks to be used in paving Houston street. These blocks have been placed on a cushion of sand and liquid asphalt was used to fill the spaces between the blocks.

To Contract for 108 Miles of Road.

Santa Ana, Cal.—According to the annual report of County Highway Engineer Halladay, made to the County Highway Commission, there will be $100,000 of the good roads bond money left in the treasury. This is estimated by comparison of the cost of work already done and work still to be done before the 108.28 miles of good roads provided for in the original plans of the commission are finished. The total cost of all roads contracted for up to March 1, 1914, and the Talbert bridge is $412,177.53. Taking out the cost of the bridge leaves a total of $396,197.74 for the cost of the roads completed and under contract. Those roads have a total mileage of 42.74, making the average cost per mile $9,269.95. The original estimate was that the road system could be built for $12,000 per mile. Of the $1,339,876.94 realized from the sale of the bonds, including the premium, there remains $917,699.41 for 65.54 miles of road to be contracted for after March 1, 1914, to which time the report takes the work. Since then the Laguna Beach road has been contracted for. It is 10.43 miles in length. Engineer Halladay's report shows that all of the survey work has been completed for the 108.28 miles, and that two-thirds of the office work has been done. The surveys have cost $6,740.48, an average cost of $62.62 per mile; for office work, $5,555.99, an average cost of $60.32 per mile.

Maryland Contemplates Changes in Road Policy.

Hagerstown, Md.—According to statements made by members of the Good Roads Commission before the Ways and Means Committee of the State Legislature, $9,170,000 have been appropriated for roads, exclusive of the $6,600,000 appropriated at the last session. Out of the $9,170,000, 489 miles of road have been constructed at an average cost of $9,963 per mile, the total amount spent being $4,871,907. Under the Price bill, which passed the recent session of the Legislature, changes are contemplated which will affect the Shoemaker law. In the construction of roads, instead of having the state pay 50 per cent., the county 40 and the adjacent property owners 10 of the expenses, as under the Shoemaker law, the Price bill makes the state pay 75 per cent. and the property owner 25 per cent. Property holders within two miles of either side the road share the cost, the holders being divided into three classes according to benefits received. Owners have five years within which to pay off the money advanced. The appropriation of $300,000 annually for Shoemaker roads will be distributed on the mileage basis as heretofore.

$149,100 Road Fund Allotted.

Denver, Colo.—The State Highway Advisory Board has announced the allotment of $149,100 to the various counties of the state for road improvement work this year. A special allotment of $30,500 was made for the completion of the Elwood Pass road which will connect the San Luis valley with the southwestern part of the state. Last year $28,000 was expended upon the road. It is expected that the highway will be finished by September. The appropriations were made for continuation of the road improvement work begun last year. Altogether allotments amounting to $172,400 have been made this year. It is expected that the board will be able to make a further distribution about next September.

University Experiments on Road Material.

Ann Arbor, Mich.—The civil engineering department of the University of Michigan will start a series of experiments to determine what use can be made of the waste products of sulphite factories. This investigation will be along the lines laid down by Dean M. E. Cooly that the department of engineering would seek to be a department of public service to the state. Professor H. E. Riggs, head of the civil engineering department, said that a New Jersey firm had for several years shipped quantities of a material known as glutrin to Michigan for use in the making of roads. He said the material from which this was made was similar to the waste that comes from the wood pulp mills in this state. According to Professor Riggs, this waste pollutes the streams and kills fish.

Department Engineers Instructed in Brick Paving.

Albany, N. Y.—About 175 engineers in the State Department of Highways took their first lesson recently at the Albany headquarters on the subject of brick and concrete construction for highways. The department has determined, as far as practicable, to build these types of roads

hereafter. The school of instruction was called by Commissioner John N. Carlisle, and was addressed by experts. Among the instructors were W. P. Blair, secretary of the Paving Brick Manufacturers' Association. Mr. Blair has had more than thirty years' experience in the construction of brick pavement, largely in Cleveland and other western cities. G. A. Ricker, first deputy commissioner; P. Schultze, second deputy commissioner, both of whom have had charge of a large amount of brick construction, and W. M. Acheson, division engineer, who was the engineer in charge of the laying of the brick roads in the Panama Canal Zone, also spoke on this subject.

Council Committee Investigates Wood Block.

Providence, R. I.—The highway committee of the City Council has made a tour of inspection in New Jersey towns and in New York to view the wood block paving there. While in the New Jersey towns a visit was made to a plant where wood blocks are manufactured and all the processes were fully shown . The committee gained considerable knowledge of the manner in which highways, surfaced with wood blocks, are wearing in unusually heavily traveled districts, and members of the committee were highly satisfied with the results found. In New York City they inspected 20 miles of the 125 miles of Manhattan streets paved with wood block. They were favorably impressed as to the wearing qualities of the material. They were shown streets which are being paved at the present time with wood blocks, and were told that the city is negotiating a highway loan of $2,500,000, one-third of which is to be spent for wood block pavement on residence and commercial streets.

Rejects Bill to Construct Road on Aqueduct.

New York, N. Y.—The Highland Park Boulevard bill, by which it was proposed to use the line of the aqueduct from the Ridgewood Reservoir to the Queens Borough line, as an extension to the Brooklyn boulevard system, has been rejected by Mayor Mitchel. In his memorandum on the bill, the mayor said that, if a boulevard be constructed as suggested, it would be placed under the control of the Department of Parks. The Commissioner of Water Supply, Gas and Electricity protested against the bill on the ground that a roadway above the aqueduct ought to be placed under the control of his department. At some points the aqueduct is so near the surface that injury might be sustained by it were the road built. Mayor Mitchel suggested that citizens, introducing bills affecting city departments, should consult with the Commissioner at the head of these departments before securing passage through legislature. After certain safeguards have been taken the mayor considers it possible that a roadway be constructed.

Grade Crossing Protection Only for Improved Roads.

Trenton, N. J.—By an amendment inserted in the grade crossings bill, railroads will be compelled to protect only such grade crossings that are on certain streets and roads of a city or town. In another particular the bill recently signed by Gov. Fielder is not as broad as has been supposed. It does not apply to all public roads, but only to those roads which have been improved by the join action of the state, county and municipality.

Purchase Road Drags.

Halifax, Pa.—The Board of Road Supervisors of Halifax township has purchased several new road drags to be used in improving the roads. The drags were used for the first time a few days ago, and it is said that the roads where the drags were employed now far surpass the state road in that vicinity.

Large Road Fund Assured.

Whitesburg, Ky.—County Judge Henry T. Day gives out the information that there will be $186,500 available for the construction of good roads in Letcher county this year, according to the estimate, and that he will immedately call an election for the voting of bonds for the construction of the highways. There is little question that the bonds will carry.

Road Drag Day in Iowa June 15.

Des Moines, Ia.—June 15 has been designated by Governor Clarke to be road drag day, and he will issue a proclamation to this effect.

SEWERAGE AND SANITATION

City Owes Over Million for Sewer System.

Paterson, N. J.—John S. Gibson, secretary of the Passaic Valley Sewerage Commission, notified the members of the Finance Board in a communication that the city was in arrears six payments, amounting in the aggregate to $1,086,299.46. Since Jan. 1, 1913, the various installments of the city's share of the trunk sewer cost have become due but have never been paid. Mayor Fordyce received the information and said that he believed provision should be made to issue bonds without further delay. With the mayor's knowledge of finances he declared that this would be an opportune time to issue the securities. Quarterly statements have been received regularly from the Passaic Valley Sewerage Commission, each amounting to $181,049.91. The Finance Board on the receipt of each notice of payment has debited temporary appropriations for trunk sewer, and credited trunk sewer account. While this has been simply a matter of bookkeeping, $600,000 is available to the city on account of the trunk sewer, but the money has never been paid over by the city, in view of the fact that an agreement was reached at the time of the bond issue, that the sewer commission would not call on the city for any money until actual work is begun in this section. In view of the fact that surveys and plans have been made for the actual work to be done in construction of the sewer in this section, it is likely that the sewer commission will make a formal demand for a part of the payments now due.

State Orders Pollution of Creek to Cease.

York, Pa.—As the result of an investigation conducted in this city recently by a representative of the State Water Supply Commission, a number of York manufacturing concerns have been notified that present pollution of the Codorus creek must be discontinued within 30 days or prosecution will follow. In some instances, it is said, manufacturing plants have installed private sewers to conduct their sewage from the factory to the creek. It is believed that the order in question is in line with a campaign that the commission mapped out with a view of purifying all streams in this as well as other sections of Pennsylvania. Considerable expense will be incurred in carrying out the provisions of the commission's order. Some means will have to be provided for purifying the sewage that has in the past been discharged into the Codorus. It is planned to do this by chemical processes of reduction and refinement so that when it does reach the stream there will be no unsanitary deposit remaining.

Canal Construction Endangers Sewer System.

Seneca Falls, N. Y.—The citizens of this town are at odds with the state concerning the barge canal construction which endangers the sanitary sewer system built at a cost of $120,000. The trunk sewer is about 4,000 feet in length, extending to the disposal plant below the dam to be erected by the state. About 500 feet of the sewer is on state property. The village, about two years ago, was assured by state authorities that in the canal construction the state would provide for any emergency. A recent communication indicates no provisions have been made to take care of the trunk sewer and that the state looks to the village to take the necessary steps. Members of the village board said they would ask the state to construct a 24-inch cast-iron pipe sewer encased in concrete.

WATER SUPPLY

Report on Haverhill's Water Statistics.

Haverhill, Mass.—The annual report of the board of water commissioners covering the year ending Nov. 30, 1913, has been filed with the city clerk. It shows that the bonded indebtedness of the department on account of the Haverhill district is now $600,000. The sinking fund commissioners of the city have in their possession $213,489.63.

Application of this amount in payment of the bonded indebtedness, the net debt would be $386,510.37. During the year $5,000 on account of the bonds issued by the Bradford district were paid, leaving a balance of $41,000 outstanding. There were 19,763 feet of new mains laid during the year, making the total mileage of main pipe in the city about 106. Including the new reservoir there has been expended in the Bradford district, during the past two years, more than $50,000. In consequence of the large amount that was spent in this section during 1913, very little work was done in Haverhill district, with the exception of ordinary extensions called for by the growth of the city. The total receipts amounted to $140,626.70, which, with the overdraft of $21,433.75, amounted to $164,811.95. The total expenditures amounted to $164,499.51, with cash on hand Nov. 30, $312.44. In the statistics of consumption of water was estimated: Total population to date, 47,500; established population on lines of pipe, 44,350; estimated population supplied, 43,850; total consumption of water for the year, 2,188,783,374 gallons, passed through meters, 385,996,500 gallons; percentage of consumption metered, 17.6; average daily consumption, 5,996,668; gallons per day to each inhabitant, 127; gallons per day to each consumer, 136; gallons per day to each tap, 818; cost of supplying water per million gallons, figured on total maintenance, $18.43; total cost of supplying water per million gallons figured on total maintenance, plus interest on bonds, $30.24.

Town's Water Supply Assured.

Steelton, Mich.—Apparently the problem of supplying pure water to the town of Steelton is solved. Most gratifying results have been realized from the experiment of sinking artesian wells. The work being executed under the direction of Town Engineer Redfern is progressing very satisfactorily. At the Connaught Park well where 2½-inch pipes have been sunk, the town was successful in obtaining a supply at the rate of 350 gallons per minute, which is more than twice the present consumption by the town. It is the intention now to sink a 4-inch pipe in order to test the well. Before the town could think of going ahead with the work of erecting a standpipe it would be necessary to get a continual flow of at least 450 gallons per minute.

Commission Inspects Water System to Fix Valuation.

Racine, Wis.—Members of the State Railroad Commission have been in this city in order to look over the plant of the Racine Water Company with a view of securing data which will enable them to more thoroughly understand the arguments of the city and the company in fixing the valuation of the plant. During the past few days men have been digging up the streets in parts of the city to determine how deep the mains were laid. In some sections it was found that the mains were laid only 26 inches under the surface. Such figures are desired so that the cost to the company in excavating for the mains can be determined.

Renew Fight for City-Owned Water.

Queens, N. Y.—The veto of the Foley-Maier water bill by Gov. Glynn has given the residents of Queens high hopes of relief from present burdensome conditions, through the early taking over by the city of the various private water companies now serving the borough. About a year ago the late Mayor W. J. Gaynor, under a resolution passed unanimously by the Board of Estimate, appointed a commission to examine fully into the real valuation of the plants of the private companies, and to make its report at as early a date as possible. That report, says Mayor Mitchel, will be ready in about a month. The report will give the values of real estate, mains, pumping stations and machinery, as separate from the franchises, upon which little value is placed.

Test 17,000,000 Gallon Pump.

Cincinnati, Ohio.—Service Director Fosdick, Superintendent Hiller, of the Water Works, and a number of other officials, visited the East End pumping station to witness the test of the new 17,000,000-gallon a day capacity pump. The pump has been installed recently, and it is expected to meet the needs of the people of this city for years to come. There were no set exercises, but quite a number of citizens were present to witness the test. The engine was started by Service Director Fosdick, and the new pump worked as though it had been in service for years. Engineer B. Baldwin was present as a guest of the officials, and he found the pump satisfactory.

Main Pump Out of Commission.

Atlanta, Ga.—The main pump in Hemphill station went out of commission on account of cracks in the framework, so that the city is at present supplied by three old pumps. At a special meeting of the Board of Water Commissioners bids were opened on repairing the pump. They ranged from $1,000 to $5,000 and all bidders stated that from 30 to 40 days would be required to make repairs. The large pump was purchased at a cost of $133,700 and was placed in operation in 1910. Hemphill station supplies water directly through the city mains. Though Atlanta consumes 16,000,000 gallons per day, the main pump has a daily capacity of 20,000,000 gallons. Water is now being supplied by three Holly pumps, two of which yield 10,000,000 gallons per day and the third 15,000,000. This being twice the city's normal consumption there is no danger that the city will fall short of an adequate water supply.

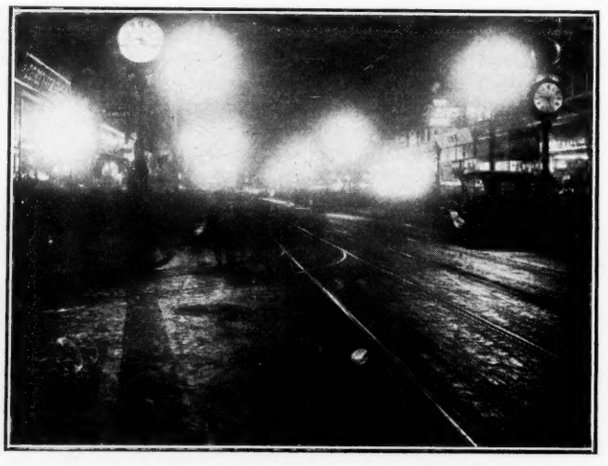
Vote Additional Bonds for Improved Water System.

Canadian, Tex.—Active progress is being made on the water system for Canadian. A large force of men is at work putting in the mains and the foundation for the standpipe is nearing completion. On April 11 an additional issue of $4,000 water works bonds was voted. This fund will lay mains in all the outlying parts of the city.

STREET LIGHTING AND POWER

Sixty-seven Magnetite Arc Lamps Installed.

Jersey City, N. J.—Newark avenue, one of the busiest streets of this city, has recently been changed into a "great white way." Sixty-seven 6.6-ampere magnetite arc lamps have been installed. Of these, 59 were placed on Newark avenue, between Warren and Coles streets, and 8 were installed on Grove street, between Newark avenue and the City Hall. The lamps were put at intervals of 75 feet. To Commissioner James Ferris is given the credit for making the "white way" movement a reality.



Courtesy The Jersey Journal.

JERSEY CITY'S "GREAT WHITE WAY."

Light Committee Wants Electric Truck to Cut Expenses.

Kalamazoo, Mich.—The report of the lighting committee of the council for the year just closed shows a marked improvement in the street lighting system of the city. During the past year provisions were made for the installing of 333 ornamental lights in the business districts and 500 new approved street arcs for the resident services. The lighting of the city is now in a better condition than ever before. In the report the committee recommended that a service car be purchased to take the place of the present equipment for answering emergency calls for repairs on the different systems in the city. The committee recommended that the car be purchased in order to develop the

highest efficiency in answering all calls. An electric truck should also be put into service to do away with the annual expense of hauling and carting. Close to $900 were expended last year for drayage.

City Faces Problem in Plant Purchase.

Denison, Ia.—The voters of Denison have voted to buy or erect a municipal lighting plant. On this vote the council entered into an agreement with the local company to buy the plant at a valuation to be agreed upon by three experts, action to be taken within thirty days of the filing of the experts' report. Recently, two of the experts reported the value at $30,000. Professor Hill, of Iowa City, the city's expert, dissented, setting the value at some $18,000, and scoring the company for not giving him full information. The council has not decided what is best to do, and in the meantime the thirty-day limit is nearing an end, after which the city can be sued for breach of agreement.

Lower Light Rates for New Orleans.

New Orleans, La.—Commissioner Lafaye has given out a statement in which he intimated that the plan for building a municipal lighting plant may be abandoned, owing to the New Orleans Railway & Light Company having responded favorably to his ultimatum that it must lower rates for electric light and power or he would build the plant. For several months Mr. Lafaye has been sparring with the company officials and was well prepared with a mass of facts and figures as to costs of electricity in various cities, and the cost of erecting a municipal lighting plant. From the information in hand he was convinced that unless the company made a substantial reduction in its rates here it would be more profitable for the city to take its contract for lighting from the company and establish its own lighting plant. The contract for the municipal lighting expires in September, 1915. At present, lighting is costing the city between $250,000 and $300,000 per year.

Offer to Lower Gas Rates.

Newark, N. J.—In a hearing before the Public Utilities Commission on the question of gas light rates in Union and Middlesex counties, F. J. Faulks, counsel for the five gaslight companies, the Elizabethtown Gas Light Company and its subsidiary concerns, formally offered to make a change in the present rate, if a minimum charge of 50 cents per month is allowed by the commission. The present rate is $1.25 per 1,000 feet, with a discount for all amounts of 1,000 feet or over, providing payment is made within ten days. Mr. Faulks's offer was to make the rate $1.10 per 1,000 feet on all amounts, with a minimum charge of 50 cents, and a discount of 20 cents per 1,000 feet for prompt payment.

Open Gas Cocks Endanger Many.

Gloucester City, N. J.—As a result of an accident, a few days ago, in the gas plant of the Public Service Gas Company, the gas was turned off for two hours after 9 P. M. Many of the inhabitants of the city had retired, leaving a small light burning, which went out as the gas supply was stopped. The police notified the company not to resume the supply for fear that the gas might escape through the open jets. The Public Service, however, turned on the gas. When the police discovered this, several alarms were sounded from the City Hall fire alarm box, and nearly every resident was thus aroused. There were no asphyxiations.

Troy, N. Y., in Darkness As Result of Flood.

Troy, N. Y.—As a result of the bursting of a penstock at the electric plant at Spiers Falls, due to flood conditions, this city and adjoining towns were in darkness, and the trolley lines were tied up. The flood in this city, Watervliet and Green Island rose to an unprecedented height, resulting from the recent rain and melting of snow in the woods nearby. Many factories were obliged to shut down.

FIRE AND POLICE

Try Signal Boxes As Peg Posts.

New York, N. Y.—Police Commissioner Woods's new system for patrolling certain districts of the city which may replace the peg posts introduced by ex-Commissioner Waldo, had a trial recently in the Twenty-ninth Police Precinct, which is in the upper part of Manhattan. There are nine signal boxes in this precinct which connect with the station house in East Fifty-first street, near Third avenue. A patrolman was stationed on peg post at each of these boxes ready to receive calls from the station house. The other patrolmen were sent out on beats which were so laid out that the patrolmen frequently passed one of the boxes. Each of the patrolmen on beat was also instructed to report once an hour to the station house by means of the signal boxes. The men on peg post at the signal boxes were directed not to leave their posts until relieved. Commissioner Woods believes that by this system the lieutenant at the station house will be able, with little delay, to get into touch with any of the patrolmen in the precinct.

Policewoman Appointed.

Amsterdam, N. Y.—Amsterdam now has a policewoman, probably the only one in this section, in the person of Miss G. Sanford, local representative of the State Charities Aid. Miss Sanford has been formally appointed a special policewoman by Commissioner of Public Safety Kaufman and immediately upon her appointment took the oath of office before Deputy City Clerk William Donohue.

MOTOR APPARATUS

Receive White Fire Truck.

Westerly, R. I.—A new White 30 h. p. combination motor fire truck has been received here and demonstrated. The truck is fully equipped with a hose chemical machine, ladders, extinguishers and all the equipment necessary to fight a fire, and will carry 1,500 feet of hose and about fifteen or twenty men. It is powerful and is built especially for the purpose, having a long wheelbase. The rear wheels are equipped with double pneumatic tires, so that in case one should be punctured another would be in readiness to support the car.

Order La France Engine and Combination Truck.

Key West, Fla.—The Fire Department has ordered an American La France pumping engine and a combination chemical and ladder. These machines are to be delivered within 120 working days. A combination chemical and hose wagon, of the Howe make, was also ordered, which will carry two 40-gallon chemical tanks, 90 feet of ladders and 1,000 feet of 2½-inch hose. Some time ago the County Commissioners purchased a 35-h.p. Reo and had the chassis turned over to Engineer Wetmore, of the water works, to be built into a combination chemical and hose. The work was well constructed, and the motor truck is now equipped with all modern apparatus.

Boyd Combination Car Accepted.

Pottsville, Pa.—The combination chemical and hose car, recently delivered to the American Hose Company, Pottsville, Pa., by James Boyd & Brother, Inc., Philadelphia, has been accepted by the fire committee of that company. The apparatus was first submitted to a severe test, being driven up the steepest hill around the town, with its full complement of hose and chemicals, and an additional load of ten men. During the entire test the motor worked perfectly. Mayor Mortimer and the fire committee expressed themselves as satisfied with the new truck.

GOVERNMENT AND FINANCE

Mayors' Conference to Have Interesting Sessions.

Syracuse, N. Y.—Mayor Louis Will and a large delegation of Syracuse officials expect to attend the fifth annual conference of mayors and other city officials of the state which will be held in Auburn June 3, 4 and 5. Those preparing the program announce that it promises to be the largest and most interesting session ever held. It is understood that several new officers will be elected and some of the topics of live interest in municipal affairs will be discussed. H. W. Waite, city manager of Dayton, O., will be one of the speakers, according to announcement of Secretary William P. Capes. At the opening session he will discuss the advantages of the city manager plan of government. Governor Martin H. Glynn is scheduled to speak on "The State

and the Municipality" at the same session. Robert S. Binkerd, secretary of the City Club of New York, will speak on municipal home rule. Dr.. Herman M. Biggs, the new state commissioner of health, will speak at the session of June 5 on questions of public health, and Mayor John Purroy Mitchel of New York is to be another of the speakers. He will discuss the relation of the city to its employes at the second evening meeting.

Optional Charter Bill Passed in New York.

Albany, N. Y.—Gov. Glynn has signed the Murtagh-Sullivan optional city charter bill which gives all cities of the second and third class the right to adopt a simplified form of charter. The underlying principle of the new law is home rule. Under it, seven optional forms of charter are offered to the cities. Two of these are variations of the commission form of government under which over 300 cities in the United States are at present governed and which the legislature of 1914 provided for the city of Buffalo. The third option provides a charter of the "city manager" type, similar to the recently adopted charters in Dayton and Springfield, Ohio, and to that enacted by the legislature this year for the city of Olean. There is another form which provides for a mayor and a small council or commission of three or five members elected at large. Still another plan calls for a mayor and common council of nine, elected at large. The sixth plan involves a government by a mayor and a common council, to be chosen from the existing wards. The seventh option is applicable to third-class cities only. It allows them to adopt the White uniform charter law for second-class cities with salaries on a lower schedule. Through all of these charters runs the short ballot idea.

New York Run Like Business Organization.

New York, N. Y.—City Chamberlin Henry Bruere at a recent banquet said that the day of the political grafter, so far as the administration of New York City is concerned, is gone irrevocably. It was the belief of the chamberlain that the men in charge of this city's administration were better qualified for their work than the administrative heads of any other American city. He said that Mayor Mitchel proposed to make his office one of a business manager. Ultimately New York City's Government was expected to become the pacemaker for other business organizations.

Mayor Wants Commission Government.

Burlington, Vt.—Mayor Burke in his message delivered before the Board of Aldermen strongly advocated the adoption of the commission form of government as a means of eliminating the inefficiency resulting from aldermanic rule. The part of Mayor Burk's message bearing on this proposed change follows:

"Of the many recommendations I have made for the betterment of our city, to my mind, the one which is the most vital and important and of a fundamental nature, is the urgent need of a change from our present and antiquated style of government to the present and up-to-date style, known as a Commission Form of Government, which has already been adopted by over three hundred of the most progressive cities all over the country. Without going into details as to its form and results accomplished, I will simply say that the city of Galveston and many others I might mention are standing monuments of the results of a change to this form of government, and should act as a beacon light to encourage other municipalities to follow their example. From the knowledge I have gained as to the results obtained in other places, I am convinced that here in the city of Burlington, many of the things we need and are restrained from having, we could have without increasing our tax levy, provided our city was managed on up-to-date business principles. As a conservative estimate, by adopting a single feature of all commission forms of government, purchasing agent for all departments would save at least twenty thousand dollars each year."

Purchasing Agent Saving $35,000 Annually.

Birmingham, Ala.—At the present rate of decrease in city expenses effected by the new purchasing department a saving of over $35,000 per year will be made for the city treasury in the departments in charge of Commissioner James Weatherly. The one great aim of all three of the commissioners is economy, and all three are making telling strides toward the reduction of expenses in the different divisions of the city government. The new purchasing department was inaugurated by Mr. Weatherly six months ago, and R. M. Griffin placed at the head of it. Before that all the supplies for the city were bought through the comptroller's office. Mr. Griffin was placed in charge of the new department and the new city warehouse was constructed on the Southside, enabling the department to buy supplies in large quantities and store them away for future use, thus getting cuts in prices. Part of Mr. Griffin's report follows:

Cost sheet showing comparative cost of supplies purchased before and after warehouse was put in operation. The comparison is for six months of last year (when we had no supply house) against six months of this year since warehouse has been established.

Cost for six months last year	$79,439.78
Cost for six months this year	62,005.37
Reduction	$17,434.41

The warehouse is working well; practically all of the supplies are going through it now and are being distributed without any loss at all.

Reject Commission Government.

Collingswood, N. J.—By the close margin of 28 majority commissioned government has been rejected by the people of the borough at the special election. The vote was 393 for to 421 against the adoption of the law. The larger part of the negative vote was cast in West Collingswood, where the residents had expressed the fear that they would have no representation in the Commission. They voted two to one against it. Not more than 40 per cent. of the vote was out.

STREET CLEANING AND REFUSE DISPOSAL

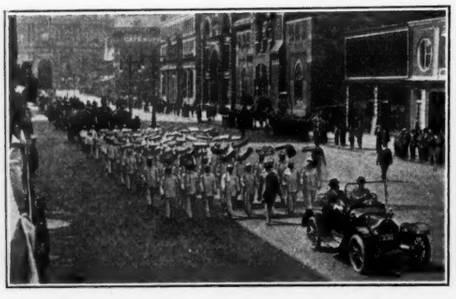
Electric Plant Connected With Garbage Incinerator Fails.

Milwaukee, Wis.—The establishment of an electric generating plant at the garbage crematory is said to be a failure. This was the answer given a delegation of residents along the Milwaukee river, who visited the public works department to complain of the stench arising from the river. The plant, which was established for the purpose of operating the river flushing tunnel, is found to be inadequate, and the flushing tunnel was only operated about six hours per day recently with the current from the plant. Commissioner Simmons promised that the plant will be kept in operation twenty-four hours a day if the city has to burn coal for only that purpose at the incineration plant, or receives power from the McKinley park pumping station.

Street Cleaners Parade in Philadelphia.

Philadelphia, Pa.—Over 2,000 street cleaners and their equipment, consisting of wagons, carts, sprinklers, flushing and squeegee machines, marched in parade on April 18. This parade was a prelude to "Clean-up Week," which was very successful. Three disinterested judges from other cities conferred special prizes on the contractors whose men and equipment made the best showing. Experts complimented the city on the splendid showing made by

Courtesy Philadelphia Record.
Block Men.



PHILADELPHIA STREET CLEANERS' PARADE.
Street Sweepers.

Garbage Wagon Section.

the "white wings." Speaking of the parade Director Cook said: "The parade of the street-cleaning forces gave the greatest pleasure to everybody who has the progress of Philadelphia at heart. It sets a standard for men, horses and equipment below which we can never fall. The high levels of this year will become targets to be equaled or surpassed in succeeding years. This parade is a part of the general campaign for publicity. The goal of municipal administration today must be a complete understanding on the part of the public of what we are trying to accomplish and the means by which we are accomplishing it."

Sprinkler Saves $300 in Two Days.

Bridgeport, Conn.—About 100 men were at work giving the streets their regular spring cleaning. The city has saved during the last two rainy days, by reason of the new street sprinkler, about $300. With the old method of contracting with the Burns Company for the street water sprinkling, that concern received at the rate of $150 a day for the work, no matter what the weather conditions were. Now that the city is doing its own water sprinkling, the work is not done in rainy weather. The only expense in connection with the sprinkler was the salary, $6 per day, to the men who operate the machine.

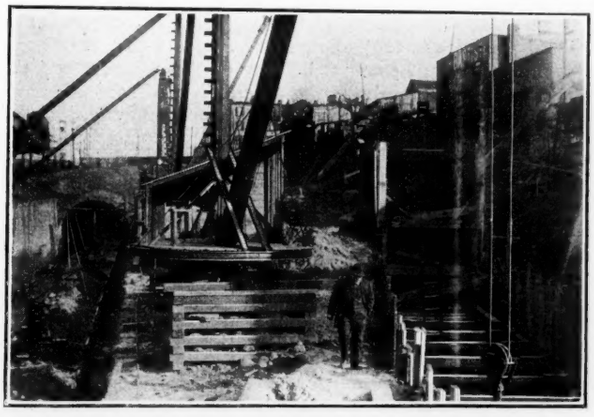
RAPID TRANSIT

Report Bill to Prevent Crowding on Cars.

Boston, Mass.—A bill, unique in its character, has been reported to the legislature, designed to prevent the crowding of street cars. The bill requires that the passengers standing after the seats are filled shall not be more than 50 per cent. of the seating capacity of the car, and that capacity shall be posted publicly in the car, so that it will be a simple matter for any man with complaint to count and see if the law is violated. Then, if he can get nine others to sign with him a complaint to the local authorities, he can go ahead with his case.

Propose to Build Interurban Railway.

Opelika, Ala.—A movement is on foot here to build and operate an electric railway line between this city and Auburn. W. S. Lounbury, secretary of the Opelika and Lee County Chamber of Commerce, stated that a survey of the line would be made soon and that in all probability work of grading the road would begin immediately after the survey is completed. The survey will be made on the north side of the Western of Alabama railroad tracks. It is understood that Chicago capitalists are interested in the project, and that the road when built will be equipped in the most approved and modern manner.

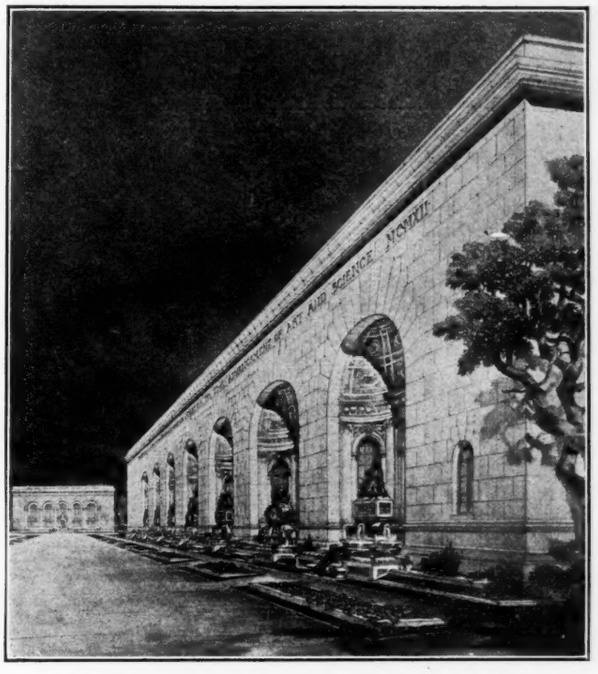


Courtesy the Brooklyn Daily Eagle.
EXCAVATING FOR SUBWAY IN BROOKLYN, N. Y.

MISCELLANEOUS

Oakland to Build a Municipal Auditorium.

Oakland, Cal.—Oakland, after completing its beautiful city hall erected at a cost of nearly $2,000,000, is now turning its attention to the building of a municipal auditorium and museum. The auditorium building, to be situated on a prominent hill facing Lake Merritt, in a 160-acre park, will have a front of 400 feet and width of 200 feet. In the western two-thirds of the structure will be the auditorium proper, with a seating capacity of 10,000. The eastern end will be devoted to a smaller auditorium for concerts and theatrical and operatic presentations. A rather unique stage arrangement will be provided for; the stage will extend the full width of the building between



NORTH ELEVATION OF OAKLAND'S MUNICIPAL AUDITORIUM.

the two divisions, with a drop arrangement that will make it available for either one auditorium or both. When completed the edifice will be one of the finest of its kind. The cost, exclusive of the grounds, will be somewhat in excess of $1,000,000. In the illustration presented the elevation to the right is the auditorium, and the smaller structure in the background is the municipal museum.

Submit Plans for Flood Prevention.

Dayton, O.—Called upon to examine into the feasibility of various plans of flood control, the government engineering corps looks with favor upon the use of reservoirs, parallel channels and levees in the prevention of disastrous floods in the Ohio and Miami valleys. This is in accordance with the report submitted to Congress by Secretary of War Garrison, who inspected conditions in this section of the country last March at the request of President Wilson. The engineering corps laid stress upon the importance, economy and efficiency of the reservoir system. The action of buildings and other obstructions in lowlands adjacent to river beds is attacked as the chief cause of the failure of the Ohio river and its tributaries to carry off flood waters with sufficient rapidity to prevent great destruction.

Mayor Hires Two Thousand Unemployed.

Montreal, Que.—Five thousand unemployed persons marched upon the city hall the other day in response to the offer of Mayor Martin to find work for the idle. The mayor addressed the men from the balcony of the city hall, after which he hired 2,000 of them on the spot to clean and grade streets and do other municipal work.

City May Regulate Auto Nuisances.

Albany, N. Y.—Municipalities are not forbidden by the state law to exercise ordinary power to suppress within their borders nuisances like the noisy use of muffler cut-outs and the discharge of excessive smoke by automobiles. Attorney General Carmody has so advised Secretary of State Mitchell May.

LEGAL NEWS

A Summary and Notes of Recent Decisions—Rulings of Interest to Municipalities

Assessments—Statutory Provisions—Validity.

Town of West Hartford v. Coleman.—That 12 Sp. Laws, authorizing assessments by municipalities, do not expressly provide for notice and hearing to the landowner does not render them void, in violation of the due process of law clause of the Federal Constitution, since the acts are not inconsistent with such a right, and it will be implied.—Supreme Court of Errors of Connecticut, 89 A. R., 1120.

Esplanade—Liability of City as Abutting Owners.

City of Shreveport v. Weiner et al.—Under Act No. 10 of 1896, apportioning the cost of paving one-third to the city and one-third to the abutting property owners, a city owning parts marked "Esplanade" on a plot of a sub-division, and setting them apart as grass plots within a curbing, and paving the space between them and the property lines, was an abutting property owner liable to one-third of the cost, in addition to the one-third expressly imposed by the statute.—Supreme Court of Louisiana, 64 S. R., 718.

Paving Assessment—Due Process of Law.

Sanders et al v. Mayor, Etc., of City of Gainesville.—Where an act of the Legislature authorizes the paving of streets in a city, and the collection of a special assessment against abutting land by execution, and provides that the owners of such land may file an affidavit of illegality and may contest the whole or any part of the amount so claimed, the levy of the assessment is not void on the ground that the owner is not afforded due process of law.—Supreme Court of Georgia, 81 S. E. R., 215.

Employee—Removal—Trial Examination.

Chace v. City Council of Providence (two cases).—Where charges were filed before a city council against relator to remove him from the position of milk sample collector for cause, the fact that a joint committee was appointed to take the evidence and report findings to the council did not deprive him of a trial before the council as a whole, it having met in joint session after the report and findings of the committee had been filed, and given relator an opportunity for a hearing before it, of which he neglected to avail himself, prior to the adoption of a resolution finding him guilty of the charges in accordance with the findings, and ordering his removal.—Supreme Court of Rhode Island, 89 A. R., 1066.

Motor Vehicles—Statutes and Ordinances.

City of Chicago v. Francis.—Motor Vehicle Law provides that no owner of a motor vehicle who shall have obtained a certificate from the Secretary of State shall be excluded or limited in the free use of his vehicle upon any public highway, but that municipalities shall be entitled to enforce reasonable traffic and other regulations relating to motor vehicles except as to speed, nor shall such owner be required to display any other number than that issued by the Secretary of State. City and Village Act authorizes the imposition of license fees on wagons or other vehicles conveying loads upon the streets of cities. Held that, while a municipality might impose license fees on motor vehicles, an ordinance making it an offense to operate any motor vehicle not bearing a license tag issued by the municipality is void.—Supreme Court of Illinois, 104 N. E. R., 662.

Levees—Repair—Condemnation of Land.

City of Mound City v. Mason.—The decision of a city council to construct or repair a levee and to obtain the material for such work by contract or condemnation fixes no rule of action or government, and prescribes no permanent course of conduct to be observed in the management of the city's affairs, and there being no charter requirement that such work shall be authorized only by an ordinance, or restricting action by resolution, the council may properly act by resolution.—Supreme Court of Illinois, 104 N. E. R., 685.

Validation of Municipal Bonds.

Thomas et al. v. City of Blakely et al.—Where an election, held to determine whether municipal bonds should be issued, resulted in favor of such issuance, and the bonds were duly validated in accordance with the Civil Code, 1910, Section 445, et seq., citizens and taxpayers, who could have made themselves parties to the proceedings to validate the bonds, but failed to do so, were concluded by the judgment rendered, and could not thereafter enjoin the collection of a tax to pay the interest and part of the principal falling due, on the ground that some of the bonds were for a purpose not authorized by the Constitution.—Supreme Court of Georgia, 81 S. T. R., 218.

Personal Inquiries—Notice.

Benson et al. v. City of Seattle.—Seattle City Charter provides that all claims for damages against the city must be presented to the council and filed with the clerk within 30 days after the damages accrued. Rem. & Bal. Code provides that a claim for damages against a first-class city, filed with the clerk, must contain a statement of claimant's residence at the time of filing the claim and for six months prior thereto. A section provides that nothing in the act shall affect any provision of any city charter relating to such claims for damages, which shall in all other respects comply with the chapter provisions, and a section makes compliance with the act mandatory upon all claimants filing claims for damages. Held, that plaintiff could not maintain an action agaist the city of Seattle for injuries from falling on a defective sidewalk, if her claim was not filed within 30 days, where she was not incapacitated so as to prevent her from filing claim for about two weeks after the injury, it not being a sufficient excuse that she thought the injuries were so trifling that she would not have to sue the city therefor.—Supreme Court of Washington, 139 P. R., 501.

Sale of Waterworks—Contract Construction.

Beloit Water Co. v. City of Beloit.—A contract of sale of waterworks to a city was made by a written proposition of the water company, and an acceptance with modification by resolution and ordinance of the city. By a previous contract the city had agreed to pay certain hydrant rentals at the state fiscal agency which by subsequent agreement were to be applied to the payment of interest on the bonds of the water company, also payable at the same agency. The city held some of these bonds, and, instead of remitting the hydrant rental, the interest coupons were delivered to the water company in payment of the hydrant rental. After a time the city ceased paying the rental, and interest payments on the bonds ceased at the same time. The contract of sale was then made, in which the city agreed to pay the hydrant rental from the date of default to the date of transfer, and to cancel and surrender the bonds it held, and all unpaid coupons, and to furnish evidence that all accrued interest had been paid. In correspondence between the date of the contract and the transfer, relating mainly to the assembling of securities and the release of the mortgage, the water company insisted that the hydrant rental should be paid in full to the date of delivery of its deed, and the city indicated its understanding that interest accruing upon the bonds it held should be applied on the hydrant rental. No reference was made to this claim of the city by the company, although it continued the correspondence for some time. In one letter the city stated the sum which would be due on hydrant rental at the date of the contemplated transfer, which was much less than the full amount, thus indicating a purpose to claim a credit. But the company made no inquiry or objection. Finally the company directed the city attorney to compute the amount of the rental, and have a remittance made therefor. The computation was made by allowing the rental from the date of the default to the date of the transfer in full, and, from that amount, the city deducted the interest for the same period on the bonds which it held, and remitted the balance. It is held that the application of interest upon the hydrant rental is warranted by the contract, in the light of the course of dealing and the correspondence showing a practical interpretation of the contract by the parties authorizing such application.—Supreme Court of Kansas, 139 P. R., 389.

NEWS OF THE SOCIETIES

Calendar of Meetings.

MAY 5-7.
NATIONAL FIRE PROTECTION ASSOCIATION.—Annual Meeting, Chicago, Ill. F. H. Wentworth, Secretary, 87 Milk street, Boston, Mass.

May 11-15.
AMERICAN WATER WORKS ASSOCIATION.—Thirty-fourth Annual Meeting, Philadelphia, Pa. J. M. Diven, secretary, 47 State street, Troy, N. Y.

May 12-14.
AMERICAN ASSOCIATION FOR THE PROMOTION OF HYGIENE AND PUBLIC BATHS.—Annual Convention, Newark, N. J.

May 14-15.
NORTH CAROLINA ASSOCIATION OF MAYORS.—Annual convention, Charlotte.

May 18-23.
FIRST CANADIAN AND INTERNATIONAL GOOD ROADS CONGRESS.—The Arena, Montreal, P. Q. G. A. McNamee, General Secretary, New Beiks Buildings, Montreal.

May 20-30.
ELECTRICAL LEAGUE OF CLEVELAND, O.—Exposition, Coliseum, Cleveland, O. W. G. Rose, Manager, Illuminating Building, Cleveland.

May 26-28.
CITY MARSHALS AND CHIEFS OF POLICE ASSOCIATION OF TEXAS.—Twentieth Annual Convention, San Antonio. C. W. Newby, Secretary, Fort Worth.

June 1-3.
NATIONAL CONFERENCE ON CITY PLANNING.—Annual Meeting, Toronto, Canada. Flavel Shurtleff, Secretary, 19 Congress street, Boston, Mass.

June 1-5.
NATIONAL ELECTRIC LIGHT ASSOCIATION.—Thirty-seventh Convention, Bellevue-Stratford Hotel, Philadelphia, Pa. T. C. Martin, Secretary, 29 West 39th street, New York City.

June 3-5.
CONFERENCE OF MAYORS AND OTHER CITY OFFICIALS OF THE STATE OF NEW YORK.—Fifth Annual Conference Auburn, N. Y. W. P. Capes, Secretary, 105 East 22d street, New York City.

June 23-25.
SOUTH CAROLINA STATE FIREMEN'S ASSOCIATION.—Tenth Annual Meeting and Tournament, Florence, Ala. R. S. Hovel, Secretary, Sumpter, S. C.

June 30-July 4.
AMERICAN SOCIETY FOR TESTING MATERIALS.—Seventeenth Annual Meeting, Hotel Traymore, Atlantic City, N. J. Edgar Marburg, Secretary, University of Pennsylvania, Philadelphia, Pa.

October 20-23.
INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS.—Annual Convention, New Orleans, La. James J. McFalls, Secretary, Roanoke, Va.

Dec. 14-17.
AMERICAN ROAD BUILDERS ASSOCIATION Annual Congress and Exposition, International Amphitheatre, Chicago, Ill. E. L. Powers, secretary, 150 Nassau Street, New York City.

Intermountain Good Roads Convention

The annual convention will be held in Butte about the middle of July.

The president is to call his committee within a short time and outline a program of events and arrange the speakers, who will be some of the most prominent men of the five states, which represent the association. The Butte committee will, however, have in charge the arrangement for entertainment of the 500 or 600 delegates who will be present, and with the assistance of the Chamber of Commerce, and its membership generally, there is no doubt but that everything for the comfort and entertainment of those in attendance will be well looked after, and taken care of.

The officers of the convention are: Lucian Peters McCalla, president, Boise, Idaho; Clinton H. Moore, vice-president, Butte; Thomas H. Burton, secretary-treasurer, Nephi, Utah.

The Montana committees are: Legislative—J. C. McCarthy, Bozeman; W. B. Russell, Missoula; L. H. Faust, Libby; Executive—Clinton H. Moore, Butte; Frank Conley, Deer Lodge; Martin Martin, Anaconda; Highway—H. C. Patterson, Dillon; William Husted, Pony; Neill McDonald, Butte; Alex Johnson, Jr., Helena; B. H. Paull, Monida.

Conference of Mayors and Other City Officials of New York State.

Among the speakers at the fifth annual conference to be held in Auburn on June 3, 4 and 5, will be Governor Martin H. Glynn, Mayor John Purroy Mitchel of New York City, State Health Commissioner Hermann Biggs, H. M. Waite, City Manager of Dayton, Ohio, and Lawson Purdy, president of the New York City Department of Assessment and Taxation. The Mayor's Advisory Committee, in announcing the conference plans, predict that the meeting this year will be the largest and most important in the history of the organization.

At the opening session on the afternoon of June 3, City Manager Waite will discuss the advantages of the city manager plan of municipal government. The next steps in the municipal home rule campaign in this State will be outlined by Robert S. Binkerd, secretary of the City Club of New York. Governor Glynn will have for his subject "The State and the Municipality." As this will be one of the big meetings of the conference, Mayor Edwin Fiske, of Mount Vernon, who will preside, has arranged to hold it in the Auditorium.

Lawson Purdy, chairman of the Conference Committee on Taxation and Assessment, at the evening session will present the results of the tax survey of the cities of the State. This survey was completed only recently, and the preliminary study of the data indicates that the committee will make several important recommendations. The importance of fire prevention work in cities will be described by Joseph Hammitt, Chief of the New York City Fire Prevention Bureau. Chief Hammitt will illustrate his discussion with motion pictures, showing fire prevention methods used in New York City.

The city officials will hold a breakfast conference the second day. At this session each mayor will discuss the next most important problem his city must solve. At the close of the symposium there will be a general discussion of the problems presented.

City planning will be the subject for discussion at the afternoon session. Charles Downing Lay, former landscape architect of the New York City Park Department, will present a program of developing parks and playgrounds, and Professor James S. Pray, of Harvard University, will talk about making the survey for a city plan. Professor Pray will discuss especially the plans for the State survey which the conference is now making.

The second big meeting of the conference will be held in the evening, when Mayor Mitchel of New York will discuss the relation of the city to its employes. Following this meeting the officials will be the guests of the City of Auburn at a luncheon, when the subject presented by Mayor Mitchel will be discussed informally.

Health Commissioner Biggs at the Friday morning session will present an efficient municipal health program, and will tell the city officials how the State will help. "Public Health Values: A Few Modern Fallacies," is the subject of a paper that will be read by Dr. Donald B. Armstrong, superintendent of the Bureau of Public Health and Hygiene of New York City. Following this session the city officials will be entertained by the City of Auburn at one of the lake resorts.

Armstrong County (Pa.) Supervisors.

The convention of Armstrong County Road Supervisors was held at Kittanning, Pa., April 6. The following program was carried out:

Convention called to order by Hon. G. W. McNees, President of Supervisors' Association. Organization and election of officers. "Earth Roads, Construction and Maintenance," D. H. Winslow, Department Public Roads, Washington, D. C., illustrated by slides and moving pictures; "Concrete Roads," W. S. Shaw, Pittsburgh, Pa., illustrated by slides and moving pictures; "Highway Bridges," Willis Whited, Engineer of Bridges, Pennsylvania Highway Department; "Earth Roads, Their Possibilities and Their Limits," Hon E. E. Dorsett, Mansfield, Pa., Overseer Pennsylvania State Grange; Discussion, "Relation of Township Supervisors to State Highway Department under Act of 1913," Hon. W. A. Wynn, Bureau of Township Highways, State Highway Department, Harrisburg, Pa.; Discussion, "Types of Roads Suitable for this Section," H. W. Clabaugh, Franklin, Pa., Engineer in Charge of Fourth District of Pennsylvania; Discussion, "Appointment of Committees." Adjournment.

PERSONALS

The following chief executives have recently been elected in New York state:

Brookfield—Horace L. Bennett, president.

Wellsville—H. B. Sutphin, mayor.

Westfield—David K. Falvay, president.

Warsaw—N. C. Beardslee, president.

Avoca—D. D. Davis, president.

Painted Post—E. G. Britton, president.

La Salls—Fred Brooks, president.

Lewiston—Fred S. Murphy, president.

Medina—Carl H. Breed, president.

Brockport—George B. Harmon, mayor.

Fairport—James H. Cotter, president.

Lyons—Wm. S. Johnson.

NEW APPLIANCES

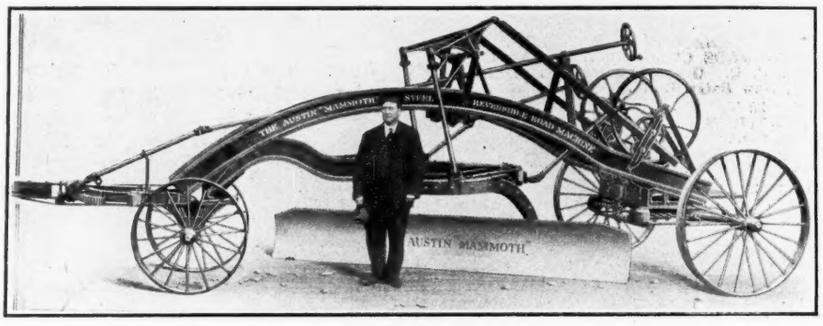
ROAD MACHINERY.

Some Interesting Designs Offered by the Manufacturers for 1914.

Road Drags. Champion. 3-Blade. A demand has arisen for road drags of simple design and large capacity. To meet this, the Good Roads Machinery Co., Kennett Square, Pa., have made the Champion three-blade adjustable road drag shown in the illustration. This drag of course requires more horses or power to pull than the two-blade drag. The blades of both machines are of the same size, 7 feet 6 inches long and 6 inches wide. The three-blade drag weighs 380 pounds, as compared with 280 pounds for the other. Blades are of high-grade hard steel and can be replaced at any time. A platform of wood or iron is built over the blades for the operator to stand on. The operating lever has a long sweep, so that the blades can be set at their extreme angles when desired. The angle is also regulated by a link which permits adjustment of the angle.

Wheel Drag Binder, Reversible. The Linder Grader Company, Muncie, Ind., have placed on the market a wheel drag which embodies some of the features of a regular road machine—for instance it is reversible. The framework consists of 3-inch channel steel, connected with the blades by pivot bolts. There are three wheels, the front 14 inches in diameter, 6 inches wide and has 1¾-inch center flange. The rear wheels are 14 inches in diameter, 3½ inches in width and have 1¾-inch side flange. The blades are 8 feet long, 5 inches wide and have a 2 by 2 angle bolted on the bottom. This has a smoothing as well as cutting effect. Levers control the angle of the blades and the depth of cut. By raising the inner ends of the blades the dirt is made to discharge underneath instead of at the ends, thus preventing the formation of an objectionable ridge. Instead of the surfacer blade shown in the illustration this drag may be furnished with 8-inch curved blades or 5-inch straight blades.

Mammoth Grader The Austin-Western Road Machinery Co., Chicago, Ill., have placed on the market a new road machine, the Mammoth, which is larger than any they have made heretofore, and is, we believe, the largest road machine made. It is made to meet new conditions. Many townships and counties have purchased high-power traction engines, capable of handling a grader of much greater capacity than any machine heretofore built. By providing the engine with a grader that develops its full tractive power considerable economy is effected. The Mammoth is built on the same general design as the Standard Austin grader, and some improvements have been added. The blade is 12 feet long, and the distance between axles 15 feet. The machine complete weighs 6,100 pounds. Weight is no objection—in fact an advantage—where tractors are used, a condition which was not true when horses only were used. The blade can be set at as acute an angle as in the case of any machine. The depth of cut or capacity of the machine is limited only by the power of the hauling engine. The Mammoth is equipped with offset poles and extension rear axle.

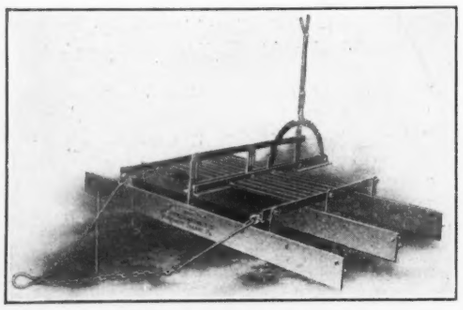


HEAVY GRADER FOR USE WITH TRACTOR.

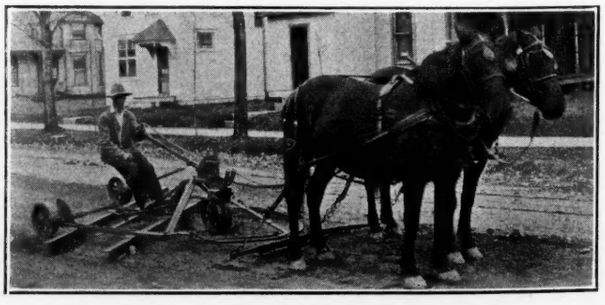
Corrugated Culverts, Rodded End. The American Ingot Iron Culvert Companies during the year 1913 made an improvement in the design of culverts which is considered as an important advance. The improvement consists in a rodded end which greatly increases the strength of the culvert. The rod is of ingot iron and is rolled into the end sections. It is claimed to increase the strength approximately 29 times over that of plain metal. Their elasticity enables them to conform to unstable and shifting foundations, and it is claimed that they will withstand conditions which would wreck any other type of culvert construction. The sections are light enough to be easily handled. The advantages arising from the purity of the ingot iron apply to the rod as well as to the corrugated metal.

Stone Bins Lifting Device. The Universal Road Machinery Co., Kingston, N. Y., have made an improvement to their stone bin which consists in a lifting device or jack. This is for use where large capacity cars, which could not ordinarily pass under the chutes, are used to take the stone from the bin to the job. The jack consists of four legs, made of heavy steel pipe, which slides in guides attached to the corners of the bin. By means of cables running over the top of each leg and under the bin to a drum, operated by a worm gear and crank, the bin is lifted bodily into the air three or four feet and safely supported, even when loaded, without the addition of any blocking. Another feature is a telescoping arrangement by which smaller pipes contained within the large ones may be let down and adjusted to the inequalities of the ground before the hoisting operation is begun.

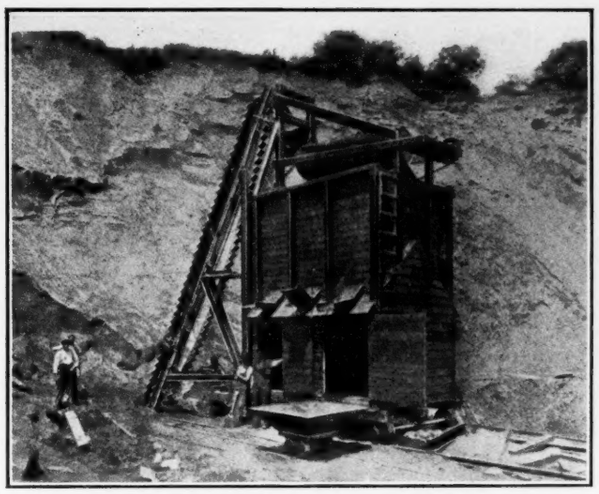
The plant is practical, compact and self contained, and quite a number of them have been built.



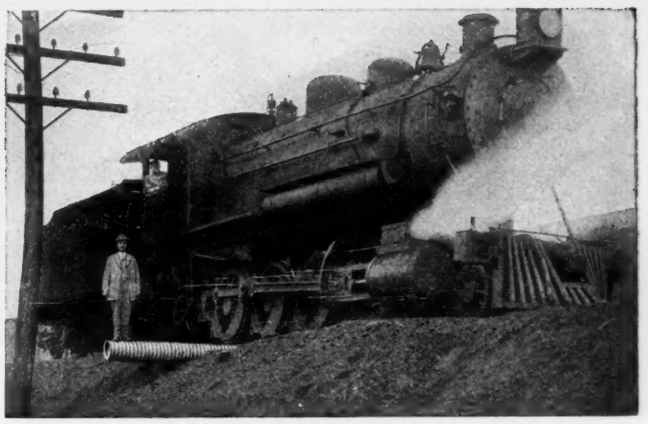
CHAMPION THREE-BLADE DRAG.



LINDER GRADER.



GRAVEL SCREENING PLANT.



TEST OF RODDED CULVERT.
Ingot Iron Culvert with Newly Devised Rodded End Sustains Weight of Locomotive.

Sand and Gravel Screening Plant. The Universal Road Machinery Co. has also placed on the market a portable sand and gravel screening plant having some novel features. The particular plant illustrated is mounted on wheels which run on a railroad track of wide gauge. The elevator is pivoted so that it swings around to 180 degrees as it works its way into the gravel bank. The plant is driven by a gas engine which may be seen through the open door. The outfit has a capacity of 300 cubic yards a day. This design is varied in many particulars to meet local conditions.

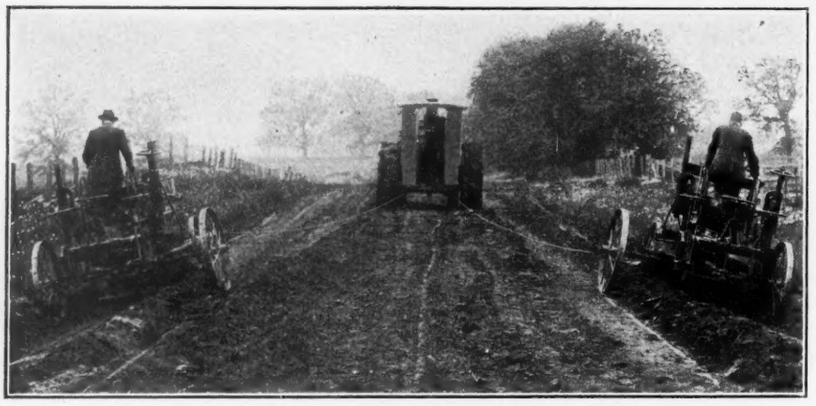
Albrecht Loader. The Avery Company, Peoria, Ill., have placed on the market a new loading machine which promises to save a large item of labor. The machine is called the Albrecht Excavator and Loader. It consists of a framework mounted on wheels, a gasoline engine, a hopper, a drag scraper and necessary appurtenances. The hopper is near the top of the machine; under it is a suitable apron. The drag scraper is operated by the gasoline engine through chains and sprockets, and a rope attached to the scraper. When ready for operation the scraper is dropped or drawn back into position. The engine pulls the scraper forward, taking a load of dirt or other material, delivers it into the hopper, from which it drops into the wagon. The need of loading machines becomes greater every year, not only on account of the increased cost of labor, but the fact that it is necessary to use trucks with higher sides in order that they may carry larger and more economical loads.

Grader and Scarifier. The J. I. Case Threshing Machine Company, Racine, Wis., have added new features to their grader—the gear-steering device and the extension hitch. The gear steering device allows the grader to be guided independently of the tractor or permits the use of two graders to one tractor. The mechanism is simple. From the hand wheel the power is transmitted through a shaft to the sleeve and knuckle joint connection, at the lower end of which is a worm which engages a worm gear. This is connected by a short shaft with a straight cog pinion, which meshes with the teeth in the bracket. The gearing proper is fastened to the pole, which has a link connection with the front axle of the grader, while the bracket is attached solidly to the axle. As the pulling power to which the pole is attached offers more resistance than the front wheels of the grader, the direction of the grader is changed as the operator turns the hand wheel. Sand and dustproof caps are used.

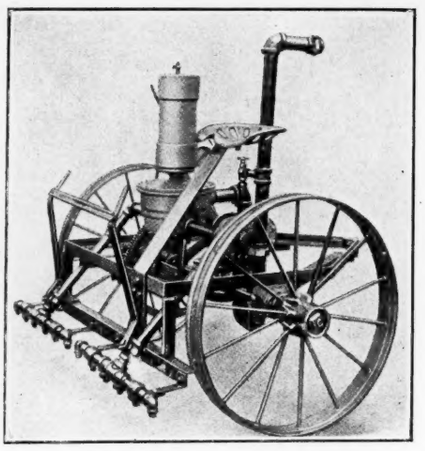
The scarifier attachment is built for tearing up the hardest kind of roads. It is built low to the ground. In the

ALBRECHT LOADING MACHINE.

LOADER IN USE.



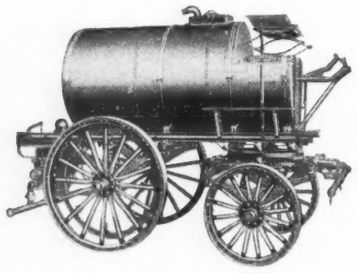
CASE TRACTOR PULLING TWO GRADERS.



UNIVERSAL ROAD OILER.

Case roller the low hitch is a new feature.

Road Oiler. The Studebaker Corporation, in their 1913 pattern improved their road oiler in some details. In the main the machine is like the regular standard pattern—that is, it



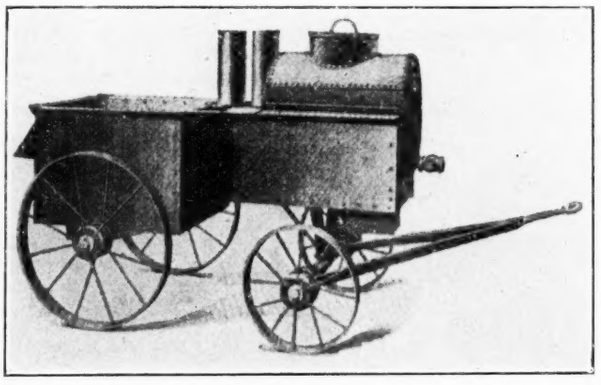
STUDEBAKER OILER.

has a rotary valveless pump operated by a chain from the rear wheel of the vehicle. In the latest machine a larger size pump than formerly is used, and an improvement in the driving sprockets, the object being to give greater power. The new pump maintains a pressure of 25 to 30 pounds. For spraying with heavy oils the Studebaker Company got out a combination heater and pressure distributor. The machine follows the general lines and principles of the machine used for cold oil, but has a steel tank with a kerosene burner under it. A small tank at the side carries the kerosene.

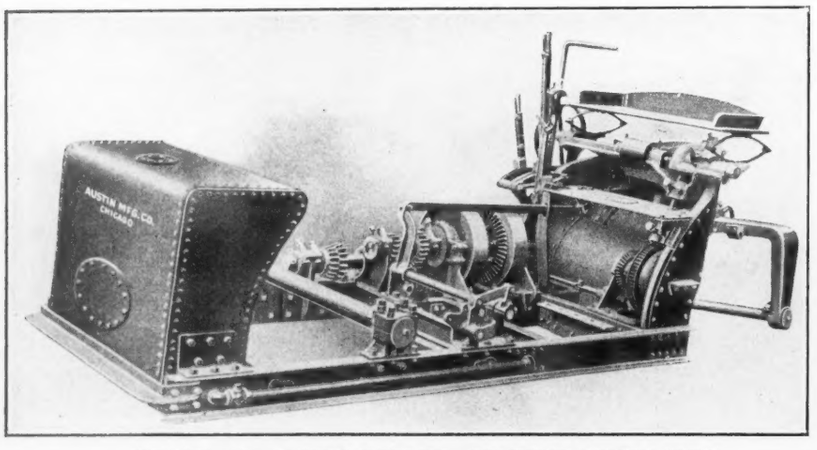
Oil Spraying Trailer. The Universal Road Machinery Co., Kingston, N. Y., have placed on the market a compact and efficient trailer for spraying asphaltic oils up to 40 to 50 per cent. gravity. The machine is designed as a substitute for more expensive tank wagons. The standpipe is connected by a suction hose to any kind of a tank or even a barrel. By means of a force pump geared to the axle the oil is drawn from the tank and forced through the large strainer box direct to the spraying nozzles. The gear is thrown in or out of clutch by a lever. The pump has a bypass for its protection. An air chamber ensures steady pressure. There are two batteries of six spray nozzles each, controlled either separately or together.

It is claimed to be a very simple and efficient device.

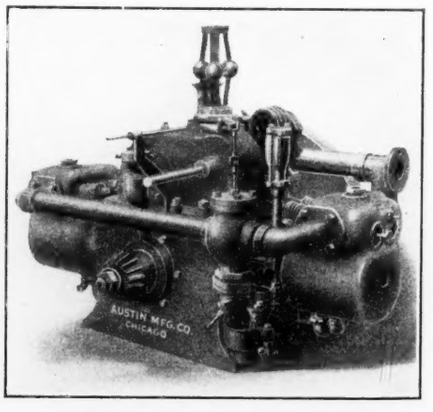
Tar Heater Gravel Dryer. Littleford Bros., 453 East Pearl Street, Cincinnati, O., have placed on the market a combination tar heated and gravel dryer which is of special value for maintenance work. For new work the separate kettle and dryer is desirable on account of capacity. Repair work, however, presents difficult problems, one of the chief of which is to do a variety of work with a small gang. Where the gang is small the waste of time in moving from one place to another is less. Hence the importance in repairing bituminous roads of having hot aggregate, sand, gravel or stone and also



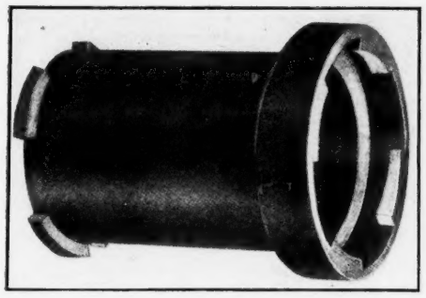
LITTLEFORD TAR HEATER AND GRAVEL DRYER.



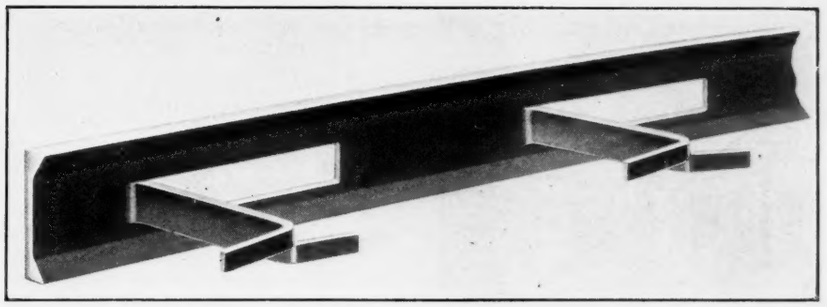
FRAME OF AUSTIN ROLLER, SHOWING MECHANISM.



ENGINE OF AUSTIN ROLLER.



LOCK JOINT CULVERT PIPE.



KAHN ARMOR PLATE.

hot bitumen. This kettle gives that opportunity. It is strongly built to stand rough usage. The capacity of the tank is 75 gallons, the gravel pan holds 9 cubic feet and the whole outfit weighs 1,850 pounds. The extreme length is 84 inches, the width 50 inches, front wheels 24 inches in diameter, rear wheels 30 inches, and the thickness of tires 4 by ½ inches. The tar tank is detachable and there are separate firing doors. There is a sliding door or shoveling pan, giving easy access to the gravel. Large fifth wheel and heavy iron about fire box are a merit of Littleford heaters.

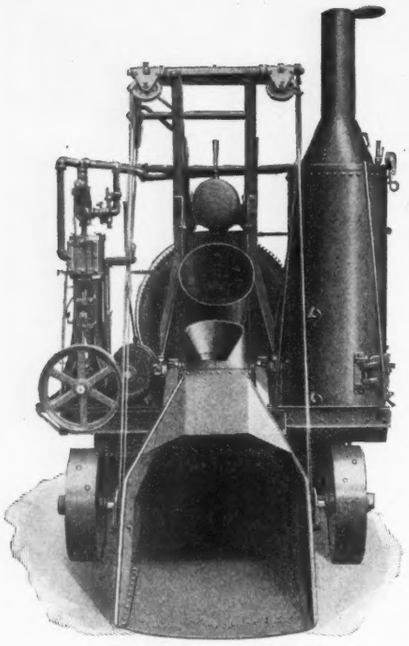
Austin Tandem Motor Roller The Austin Manufacturing Co., Chicago, Ill., after several years' experience with their gasoline motor roller, last year placed on the market a tandem roller. The general outlines of this machine have already been shown in illustrations of the Municipal Journal. Some of the important parts of the mechanism are presented here. The horizontal opposed type of engine eliminates vibration, making the machine desirable in laying asphalt or other bituminous pavements. The entire weight of the engine is kept below the level of the main roller. The roller man has a clear view of his work. The clearance of the frame is sufficient to pass over any ordinary curb. A single lever operates start, stop and reverse. There is a foot brake that operates instantaneously in emergencies. Steering is both by power and by hand. The engine is of comparatively slow speed. There are two systems of ignition. The governor insures steady running with varied loads. The transmission is mounted on one continuous steel casting, carrying all the bearings from engine shaft to rear axle. Road wheels are made of steel plates, machine finished on the surface and edges. The rear wheel revolves on the axle, which is pinned to the boxes, thus crossbracing the frame. The steering wheel is in two sections and the yoke saddle and control segment are cast steel.

Lock-Joint Culvert Pipe. The American Casting Company, Birmingham, Ala., has designed a new cast iron culvert which forms a continuous tube construction made up of single units, easily handled. It is made of pure remelted Alabama pig iron. The lengths are regularly 3 feet. On the spigot and bell ends are cast iron keys. The joint is made by rolling the spigot end into the throat of the bell and allowing the spigot keys to slip past the bell keys. By turning the entering pipe ⅛ of a turn the spigot keys enter behind the keys in the throat of the bell and draw the joints closely together. When flexibility is desired the joints are not drawn up tight. No derrick or other expensive handling equipment is required to unload and place the pipe. The tools needed are a train, a track jack and a pole. With these tools four men can handle even the 48-inch size. The short lengths save needless pipe at the ends of the embankment. This pipe is sold by the linear foot, so there is no uncertainty about the cost.

Kahn Armor Plate. The Trussed Concrete Steel Company, Detroit, Mich., have placed on the market a new joint made of a metal new for this purpose, namely, dead soft steel. Another new feature is the beveled edge, which is claimed to eliminate all possibility of the concrete breaking away back of the joint protector. In the new Kahn Armor Plate the concrete has a very decided obtuse angle, at the point of union with the steel. The new plate has the same features as the old plate—lightness, compactness, crowning, etc.—and is easily put in place with the new installing device. The extra amount of steel exposed to the wear of traffic is small, and it should wear with the pavement.

Locomotive Crane. The Browning Engineering Company, Cleveland, make a special light weight crane mounted on traction wheels, moving on planks, which is well adapted for handling materials from cars on railroad sidings into wagons. The traction wheels allow more freedom of motion than is possible for a larger crane running on a railroad track. Where the siding is long and cars likely to be delivered anywhere, this is a big advantage. The County Commissioners of Wayne County, Mich., have used three machines to advantage in unloading stone, sand and gravel from cars to wagon. The Brownhoist crane is classed as 3-ton, its maximum lift. A half yard or yard bucket may be used, according to the angle at which the boom is operated. The steel boom is 20 feet long. The traction wheels have a flange set to standard gage so that they can travel on a track if desired. A road roller is ordinarily used to haul the crane from one job to another.

LOCOMOTIVE CRANE WITH TRACTOR WHEELS.

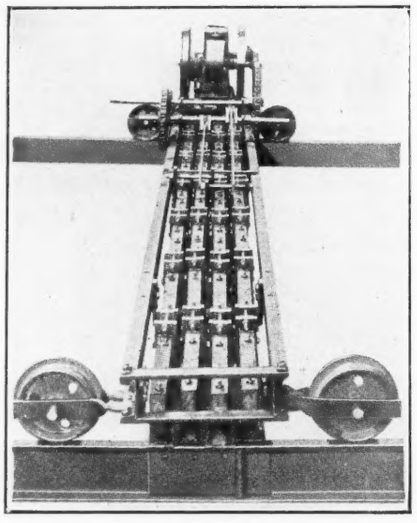


M-C CONCRETE MIXER.

Concrete Finishing Machine. The Baker Automatic Finishing Machine is a new machine placed on the market by The R. D. Baker Company, Detroit, Mich., for the purpose of doing mechanically the work of shaping and finishing the surface of a concrete road, a process which has hitherto required intelligent, painstaking labor. The machine consists of a framework which spans the roadway, four moving members which strike off the surface to a true grade and give it an even but not glazed surface. A gasoline engine moves the machine forward in striking. In floating the concrete, the engine operates the four parallel members, prominently shown in the illustration, in such a manner that the alternate members move concurrently.

Sweeper and Sprinkler. The Studebaker Corporation South Bend, Ind., have devised a combination sweeper and sprinkler specially for road work. Before a street is oiled it should be swept and to keep down dust it must be sprinkled before sweeping. The new machine performs the two processes. The sweeping and sprinkling devices are similar to those used on the regular Studebaker sprinklers and sweepers.

Concrete Mixer. The M-C Paver is a new concrete mixer recently placed on the market by the Marsh-Capron Mfg. Co., 466 Old Colony Building, Chicago, Ill. The drum handles 11 cubic feet of concrete in a batch, a 2-bag batch of 1:3:5 concrete. Either steam or gasoline power is supplied, the former being 10 horse-power with 12 horse-power boiler, the latter a 12 horse-power New-Way engine. Two traction speeds are provided for, ½



BAKER FINISHING MACHINE FOR CONCRETE.

mile per hour for use on the work and 1¾ horse-power for travelling from one job to another. The traction wheels are equipped with automobile type brakes. A differential gear is furnished in the traction drive, making it easy to turn corners. Steering is controlled by a hand wheel at the operator's platform. Steering chains have springs to relieve shock. Driving wheels are 36 inches diameter, with 10-inch face. Steering wheels are 30-inch diameter, with 8 inch face. The delivery boom consists of an open trough in which revolves a mixing conveyor. The trough has three gates, by means of which the concrete can be spread at distances of 4, 8, 12 or 16 feet from the mixer. An alternative equipment for narrow roads is a swinging chute. The loading hopper is of the pivoted type, open at the back and rounded on the edge. The hopper bottom and sides are so steep and the throat of the hopper so large that there is free delivery. All levers are on one side of the machine, under the control of one man. The platform is of checkered floor plate.

INDUSTRIAL NEWS

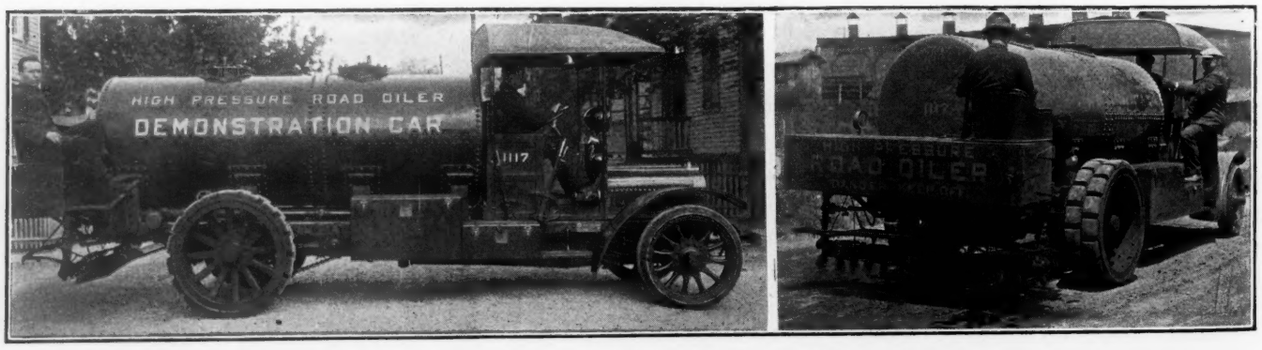
Cast Iron Pipe. Chicago. Quotations: 4-inch, $26; 6 to 12-inch, $24; 16-inch and up, $23.50. Birmingham. Quotations: 4-inch, $21; 6-inch and up, $19. New York. General demand is good, but competition is keen. Quotations: 6-inch, car loads, $22 to $23.

Lead. Quotations: New York, 3.80c; St. Louis, 3.70c.

Asphalt.—John Baker, Jr., dealer in Star brand California asphalt, has moved his Chicago office to the Otis Building, 10 South La Salle Street. The New York office remains at 17 Battery Place.

Chelreco Asphalt.—The Chelsea Refining Co., Tulsa, Okla., have published an interesting booklet describing Chelreco road oils, flux oils and liquid asphalt. Introductory matter in the book states the advantages to the farmer and others of good roads. The difference bewteen oils with petroleum and asphaltic bases is explained. The different grades of Chelreco asphalt and the uses of each are stated. There are eleven grades, each designated by a letter. At considerable length, the method of applying liquid asphalt. A cold is described, and the uses of the other given in some detail. The interesting subject of oiled earth roads is taken up and California methods described. Every car of Chelreco asphalt is tested before being used and copies of a number of the analyses given. Some tabular data regarding the number of gallons of oil required for different widths of roads per mile is added.

Carbolineum. — The Carbolineum Wood Preserving Company, 518 Prairie street, Milwaukee, Wis., will build a three-story addition 50 by 150 feet equipped with chemical and treating apparatus.



AUTOMOBILE ROAD OILER MOUNTED ON SAURER CHASSIS.

ADVANCE CONTRACT NEWS

ADVANCED INFORMATION BIDS ASKED FOR

CONTRACTS AWARDED ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
			STREETS AND ROADS	
Tex.,	Dallas	11 a. m., May	2..Paving viaduct	County Auditor.
Utah,	Ogden City	10 a.m., May	2..Furnishing materials and constructing sidewalks	W. Jenkins, City Engr.
Ill.,	Springfield	10 a.m., May	2..Laying brick pavement in two streets	Bd. Local Imps.
Minn.,	Herman	2 p.m., May	2..Constructing four highways	F. C. Anderson.
Minn.,	Chokio	2 p.m., May	2..Four miles of highway	J. J. Honzo, Town Clerk.
Ill.,	Chicago	11 a.m., May	2..Constructing cement sidewalks	Board Public Works.
Ill.,	Ottawa	10 a.m., May	2..Grading, draining and paving	Board Local Imp.
Ind.,	Franklin	2 p.m., May	4..Grading, draining and paving	H. L. Knox, Aud.
Tex.,	San Antonio	4 p.m., May	4..Paving 14 streets with creosoted pine blocks	F. Fries, City Clk.
Mich.,	Lansing	4 p.m., May	4..Asphaltic cement for the year	P. F. Gray, City Clk.
Conn.,	Hartford	2 p. m., May	4..Road construction in several townships	E. C. Welden, Div. Engr., Willimantic.
Wash.,	Ritzville	10 a. m., May	4..7.5 miles crushed gravel road, cost $34,771	Board Co. Comrs.
Pa.,	Haverford	8 p. m., May	4..Constructing pike road	H. P. Morse, Secy.
Mich.,	Flint	3 p. m., May	4..Constructing one pavement	D. E. Newcomb, City Clk.
Conn.,	Hartford	2 p. m., May	4..Macadam, conc. and asphalt pavements in several towns	State Hwy. Comn.
N. Y.,	Fulton	May	4..Paving about 20 blocks with various materials	G. C. Hill, City Engr.
Minn.,	Glyndon	May	4..Grading several miles of road, with ditches, etc	B. J. Gunderson, Town Clerk.
S. D.,	Watertown	8 p.m., May	4..22,500 sq. yds. paving, various materials	O. M. Lane, City Aud.
Mont.,	Kalispel	May	4..Cement curb and walk for 1 year	C. J. McAlister, City Clk.
Ind.,	Vernon	11 a. m., May	4..Stone road in townships	G. J. Bumhart, Aud.
Ind.,	Hartford City	May	4..One township road	County Auditor.
Ala.,	Florence	May	4..Constructing ½ mile water bound macadam, curb & gut	Lund & Hill, Little Rock, Ark.
Ind.,	La Porte	10 a.m., May	4..Grading, draining and paving number of streets	F. A. Hausheer, Co. Aud.
Cal.,	San Jose	May	4..Road improvement	J. G. McMillan, Co. Surv.
Ind.,	Rising Sun	1 p.m., May	4..Grading, draining and paving highway	Co. Comrs.
Ind.,	Versailles	1 p.m., May	4..Grading, draining and paving highway	F. Lockhardt, Co. Aud.
Ind.,	Greenfield	May	4..Furnishing and delivering grades of crushed stone	Co. Comrs.
N. D.,	Beach	8 p.m., May	4..Furnishing 600 gal. street sprinkler	M. A. Eagan, City Aud.
S. D.,	Mitchell	2 p.m., May	4..Grading and improving 6 miles	R. A. Zangle, Aud.
N. D.,	Washburn	2 p.m., May	5..20 or more scrapers; about 5 road plows	E. C. Stocker, Aud.
N. C.,	Rocky Mount	May	5..40,000 sq. yds. paving, various materials; also 10 miles sewer and gas pipes	Board of Aldermen.
Pa.,	Harrisburg	10 a.m., May	5..Highway work, including pavement, etc., five jobs	E. M. Bigelow, State Hwy. Comr.
Ark.,	Pine Bluff	May	5..Improving about 10,500 sq. yds. road	Board Public Imp.
S. C.,	Charleston	May	5..Paving, various materials	J. H. Doyle, City Engr.
N. J.,	Paterson	May	5..Laying sidewalks for the year	J. E. Taylor, St. Comr.
Ind.,	Madison	10 a. m., May	5..Roads in two townships	County Comrs.
Pa.,	Pittsburgh	10 a.m., May	5..200,000 gal. asphalt road oil; 80,000 gal. light asphalt and two asphalt heating tanks	R. J. Cunningham, Co. Cont.
Md.,	Baltimore	Noon, May	5..Six sections state highway improvement, 18.40 miles	States Rds. Comn.
Pa.,	Philadelphia	Noon, May	5..Paving with vit. block, granite, asphalt, etc	M. L. Cooke, Dir. Pub. Serv.
Minn.,	Cloquet	5 p.m., May	5..Walks, crosswalks and curbs for 1914	J. A. Parks, City Clerk.
Ia.,	Fort Dodge	7.30 p.m., May	5..Constructing cement curbs, walks and retaining wall	J L. Porter, Sec School Dist.
Ia.,	Clarinda	May	5..23 blocks Portland cement	T. A. Wilson, City Clerk.
Ia.,	Anamosa	10 a.m., May	5..Road improvements	E. J. Hines, Co. Aud.
Minn.,	Duluth	2 p.m., May	5..Road and bridge work in county	O. Haledon, Aud.
Minn.,	Ellsworth	2 p.m., May	5..23 concrete culverts, road work, grading and turnpiking	G. Swanberg, Auditor.
Minn.,	Two Harbors	10 a.m., May	5..Clearing, grubbing and grading	J. P. Paulson, Auditor.
O.,	Delaware	May	5..Grading, draining, macadamizing and gravelling about 4 miles	County Comrs.
N. Y.,	Bronxville	May	5..Improving one road	Village Clerk.
N. Y.,	Albany	1 p.m., May	5..Furnishing broken stone for maintenance work	J. N. Carlisle, Comr.
Md.,	Baltimore	noon, May	5..Building five sections of state highway	O. E. Weller, Chr. State Rds. Comn.
O.,	Columbus	noon, May	5..Grading, draining, curbing and paving	S. A. Kinnear, Dir. P. S.
O.,	Oberlin	noon, May	5..9,400 yds. paving, curbing and draining	W. A. Hart, Vil. Clk.
Ind.,	Bloomington	2 p.m., May	5..Grading, draining and paving	Co. Comrs.
Minn.,	Faribault	May	6..Grading, turnpiking and gravelling	County Auditor.
Fla.,	Jacksonville	May	6..Paving with concrete or vit. brick, 21,946 ft	County Comrs.
Que.,	Point Clair	May	6..Road construction	Secretary-Treasurer.
Minn.,	Hibbing	8 p.m., May	6..Constructing several roads	V. J. Benoe, Town Clerk.
N. D.,	Bismarck	10 a.m., May	6..Road grading	T E. Flaherty, Auditor.
Minn.,	Long Prairie	7.30 p.m., May	6..Two 8-horse graders, three 2-horse graders and 12 road drags	E. M. Berg, County Aud.
N. Y.,	Brooklyn	11 a.m., May	6..Regulating, grading and paving with various materials	L. H. Pounds, Boro. Pres.
Ind.,	Rockville	11 a. m., May	6..Grading, draining and bridging	County Comrs.
Pa.,	Harrisburg	10 a.m., May	6..Paving in several boroughs and townships	E. M. Bigelow, St. Hwy. Comr.
O.,	Findlay	1 p.m., May	6..31,680 ft. of stone pipe, three jobs	Co. Comrs.
Ind.,	Lafayette	10 a.m., May	6..2.01 miles gravel road, 2.49 miles	Co. Comrs.
Minn.,	Hibbing	8 p.m., May	6..Graders, dump wagons, wheel scrapers, slushers, and metal culverts	V. J. Benoe, Clerk.
N. D.,	Northwood	6 p.m., May	6..Sidewalks and street crossings	G. P. Johnson, City Aud.
Ind.,	Fort Wayne	May	6..Grading, draining and paving	C. H. Brown, Co. Aud.
Ia.,	Forest City	11 a.m., May	6..46,000 cu. yds. grading	C. K. Nelson, Auditor.
Minn.,	Northfield	1 p.m., May	6..Grading, turnpiking, gravelling, $4,113	F. M. Kaisersartt, Aud.
N. D.,	Wahpeton	7 p.m., May	7..Sidewalks, curbs, gutters, etc., for 1914	S. H. Murray, City Aud.
Wis.,	Two Rivers	7.30 p.m., May	7..Grading, curbing, macadamizing various roads	C. Baetz, Chm. Bd. Pub. Wks.
Ind.,	Angola	1.30 p.m., May	7..12,000 sq. yds. paving, various materials	C. F. Powers, Civ. Engr.
Ind.,	Petersburg	2 p.m., May	7..Four roads, aggregating 6 miles	J. D. Gray, Aud.
Ohio,	Upper Sandusky	noon, May	7..Road improvement	Co. Aud.
Minn.,	LeSeuer	2 p.m., May	7..Repairing 6.1 miles highway; also graveling, turnpiking, etc	J. H. Kaisersatt, Co. Aud.
Minn.,	Inter'l Falls	2 p.m., May	8..Constructing Rural Highway No. 9; cost, $237,000; Rural Highway No. 5; cost $25,661	L. H. Slocum, Auditor.
O.,	Cincinnati	noon, May	8..Improving pike	Co. Comrs.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Ind.,	Mt. Vernon	May 8	7 miles and 2,220 ft. road improvement	Co. Comrs.
Ind.,	Hamilton	10 a.m., May 9	Constructing gravel road	Co. Comrs.
O.,	Columbus	Noon, May 11	Improving and macadamizing several streets	Board Co. Comrs.
Ind.,	Jasper	10 a.m., May 11	Road work	Co. Comrs.
Fla.,	Orlando	2 p. m., May 11	Grading and paving with brick, five highways	Orange Co. Comrs.
N. Y.,	Cortland	May 11	9,875 sq. yds. vit. brick or block, 4,335 ft. sandstone curb	Board Pub. Works.
N. Y.,	Albany	1 p.m., May 11	Improving and repair work in several counties	J. N. Carlisle, Comr.
Pa.,	Norristown	8 p.m., May 11	Furnishing crushed trap rock, vit. block, Portland cement and vit. pipe	D. Sinclair, Chr. Hwy. Comn.
Ind.,	Jasper	10 a.m., May 11	Rock roads	J. H. Seng, Co. Aud.
Pa.,	Pittsburgh	10 a.m., May 12	Improvements on several roads	R. J. Cunningham, Co. Cont.
N. Y.,	Albany	1 p.m., May 12	Improving and repair work in several counties	J. N. Carlisle, Comr.
O.,	London	Noon, May 12	Grading and paving with various materials	J. W. Byers, Vil. Clerk.
O.,	Montpelier	May 12	15,000 sq. yds. paving	Village Clerk.
N. J.,	Freehold	May 13	Constructing section of road	J. M. Corlies, Dir.
Wis.,	Fond du Lac	May 14	Improving 4 streets with reinforced concrete pavement	J. S. McCullough, C. E.
O.,	Cincinnati	noon, May 15	Improving both pike and road	Co. Comrs.
Idaho,	Kellogg	May 15	Constructing concrete pavement, cost $12,000	City.
Wis.,	Richland Center	4 p.m., May 15	About 6,056 sq. yds. reinforced concrete curbing; also curbs and concrete waterways	O. H. Kidd, Chm. Bd. P. Wks.
O.,	East Liverpool	noon, May. 15	Paving with brick or paving blocks; eight jobs	E. J. Smith, Dir. Pub. Ser.
O.,	Coshocton	about May 15	1½ miles brick and slag road	J. R. Marker, Comr., Columbus.
Ind.,	Noblesville	10 a. m., May 15	Two gravel roads	County Comrs.
Ind.,	Sullivan	May 16	Constructing three roads, crushed stone and gravel	W. L. Sisson, Co. Surv.
Pa.,	Franklin	7 p. m., May 20	13,000 sq. yds. brick on concrete	J. G. Crawford, Clerk.
Tenn.,	Bluff City	May 21	25 miles of graded and macadam roads	Chr. Pike Roads Comm.
O.,	Canal Dover	about June 1	Constructing brick pavement	W. E. Sykes, Dir. P. S.

SEWERAGE

Ia.,	Council Bluffs	1.30 p.m., May 2	65,000 yds. district drain	J. D. Hannan, County Aud.
Okla.,	Sulphur	10 a.m., May 2	60,000 ft. sanitary sewers; cost, $52,200	H. V. Hinckley, Okla. City.
Mich.,	Lansing	May 4	Sewer construction, cost $21,000	H. A. Sparks, City Engr.
Ill.,	Cicero	8 p.m., May 4	Constructing sewer	C. Jepsen, Pres. Bd. Loc. Imps.
N. D.,	Grand Forks	4 p.m., May 4	Vitrified clay pipe lateral sewers	C. J. Evanson, City Aud.
Ind.,	Hammond	10 a.m., May 4	Sewers in one street	Bd. Public Works.
Minn.,	Kasson	8 p.m., May 4	Sewer in one district	G. R. Little, Vil. Rec.
Mich.,	Bay City	9 a.m., May 4	Furnishing material and constructing 10 and 12-inch socket tile sewer	Board Public Works.
Ill.,	Berwyn	8 p.m., May 5	Constructing sewers, two jobs	Board Local Imp.
Ill.,	Toulon	10 a.m., May 5	Sewer system	Board Local Imp.
N. J.,	Newark	2 p. m., May 5	Foundations and connections for pumping station	J. S. Gibson, Clerk.
O.,	Canton	May 5	Constructing sewage disposal plant	R. W. Platt, Engr., Cleveland
N. J.,	Paterson	4 p.m., May 5	Constructing sewer in several streets	Bd. Public Works.
Ind.,	Marion	9.30 a.m., May 5	Combined sewer system, $35,000	F. R. Heck, Clerk of Board.
Ill.,	Chicago Heights	7.30 p.m., May 5	Constructing storm water system	L. H. Hook, Pres.
Sask.,	Moose Jaw	10 a.m., May 6	115,000 ft. sewer tile pipe; also large quantities iron pipe, special castings, etc	City Comrs.
Neb.,	Grand Island	8 p.m., May 6	Furnishing material and laying 15-in. sewer; cost, $3,816	H. E. Clifford, City Clk.
N. J.,	Ventnor City	May 6	Intercepting sewer, centrifugal pumps, sewage disposal works, etc.	Common Council.
Ia.,	Sumner	May 6	Four miles sewers	City Clerk.
Ia.,	Sheffield	1 p.m., May 6	Sanitary sewer	A. C. Shafer, Town Clerk.
Minn.,	Detroit	10 a.m., May 6	One carload corrugated galv. metal culverts	M. J. Morrow, Co. Aud.
Ont.,	London	5 p.m., May 7	Storm and sanitary sewers in various streets	City Clerk.
Minn.,	Aitken	10 a.m., May 8	Constructing ditch; $90,913	J. B. Lemire, Auditor.
Minn.,	Kasson	8 p.m., May 8	Constructing sewer	G. R. Little, Vil. Recorder.
Sask.,	Estevan	9 p. m., May 9	16,000 feet sewer pipe to be laid	Sec.-Treas.
Wash.,	Cashmere	May 10	Three stage vertical centrifugal pumps and vertical type 30-h. p. motor	Town Clerk.
Pa.,	Lebanon	May 11	Vit. pipe sewers, manholes, flush tanks, etc	T. R. Crowell, C. E.
N. Y.,	Brighton	May 12	Storm and sanitary sewer, disposal plant, etc	Sewer Comrs.
Sask.,	Regina	May 12	Supplying sewer pipe, sewer brick, manhole covers and frames, etc	City Comrs.
Sask.,	Kamsack	2 p.m., May 13	Sewerage system with disposal plant, also water works system	A. A. Crawford, Sec.-Treas.
N. Y.,	Goshen	1.30 p.m., May 15	Sewer system and sewage disposal plant	G. F. Gregg, Vil. Pres.
N. Y.,	Hudson	about May 15	Constructing 1,000 ft. 15-inch tile sewer	O. J. O'Hara, City Engr.
Mo.,	Dexter	8 p.m., May 18	Sewerage system	W. Watkins, Mayor.
N. Y.,	Albany	3 p.m., May 18	Constructing sewage disposal plant and intercepting sewer	I. Wachsman, Sec. of Board.
O.,	Struthers	May 20	Storm and sanitary sewer	Village Clerk.
N. J.,	Elizabeth	May 20	Sewers in several streets	W. P. Neafsey, St. Comr.
Wis.,	Wittenberg	June 1	Sewer and water works, $30,000	A. Johnson, Vil. Pres.

WATER SUPPLY

S. D.,	Berresford	6 p.m., May 4	Reinforced concrete reservoir; capacity, 100,000 gallons	City Auditor.
S. D.,	Parker	May 4	Furnishing and install. c.-i. mains, hydrants, cost $7,000	City Auditor.
N. J.,	Freehold	8 p.m., May 4	Reinforced concrete receiving tank for water plant	Water Commrs.
N. D.,	Valley City	8 p.m., May 4	Building water main, 886 ft.	M. J. Boyd.
Fla.,	Pensacola	2 p.m., May 4	Raising two storage reservoirs	C. W. Eggart, City Clk.
Minn.,	Stillwater	May 4	Two steel standpipes	Water Board.
O.,	Youngstown	May 4	Constructing chimney on pumping station	N. E. Hawkins, Cons. Eng.
N. D.,	Valley City	8 p.m., May 4	Water mains	M. J. Boyd, City Aud.
Ia.,	Stanwood	May 5	Water works system	W. M. Thompson, Clk.
Ia.,	Tama	8 p.m., May 5	Water main extensions in various streets	T. J. McCurdy, Clk.
N. J.,	Pompton Lakes	8 p. m., May 5	Constructing water works system and elec. light plant	Mayor and Council.
Ohio,	Columbus	May 5	Erecting an alum plant	P. B. Kemper, Clk.
Pa.,	Pittsburg	May 5	10,000 positive inferential and compound water meters, with fittings, etc	Dir. Dept. Public Works.
Tex.,	Arkansas Pass	May 5	Furnishing c.-i. pipe, fittings, fire hydrants, valves, tank, tower, etc	O'Neil & Sons, Engrs., Dallas.
Ia.,	Stanwood	8 p.m., May 5	Constructing water works	W M. Thompson, City Clk.
La.,	New Iberia	6 p.m., May 5	500 tons 6-in. c.-i. pipe, 45 fire hydrants, etc. (See proposal ad.)	J. P. Superbielle, Pur. Agt.
Minn.,	New Ulm	5 p.m., May 5	Concrete reservoir	F. D. Minium, City Engr.
Minn.,	Sleepy Eye	8 p.m., May 5	Constructing a 10-inch well	H. C. Peterson.
Mass.,	Marlboro	May 6	One pumping engine, capacity 2,500,000 gals	Water & Sewerage Comn.
Man.,	St. Vital	8 p. m., May 6	Water pipe, valves and hydrants	J. Desourdis, Sec.-Treas.
D. C.,	Washington	May 6	350 low pressure hydrants	Dist Comrs.
Ia.,	Sheffield	May 6	Water works and sewer system, cost $28,000	A. C. Shafer, City Clk.
Sask.,	Estevan	8 p. m., May 9	Laying water main and constructing sewers	P. J. Stephans, Sec.-Treas.
La.,	Hammond	2 p. m., May 9	Improvements to water system	City Comrs.
N. D.,	Carrington	May 10	10,450 ft. 6-in. water meters and 17-in. fire hydrants	C. W. Heinmiller, City Engr.
Mich.,	Flushing	May 10	Extending water system	L. Mann, City Clk.
S. D.,	Madison	8 p.m., May 11	Constructing well	T. H. Waskey, Mayor.
Pa.,	Lebanon	5 p.m., May 11	55,000 ft. vit. pipe sewers	T. R. Crowell, City Eng.
N. Y.,	New York	May 12	Constructing part of Richmond conduit	Board Water Supply.
N. J.,	Belleville	May 12	Laying c.-i. pipe, valves, etc	E. E. Mathes, Town Clerk.

BIDS ASKED FOR

STATE	CITY	REC'D UNTIL	NATURE OF WORK	ADDRESS INQUIRIES TO
Tex.,	Galveston	noon, May 14	Digging two wells	J. D. Kelly, City Secy.
Mo.,	Dexter	8 p.m., May 18	Water system	W. Watkins, Mayor.
Mo.,	Dexter	8 p.m., May 18	Water works system, including well, pumping station, tower, etc.	J. I. Moore, City Clk.
H. T.,	Pearl Harbor	10 a.m., June 2	Cast-iron pipe, galv. pipe, fire hydrants, manhole frames and covers, etc	Navy Dept., Washington, D. C.

LIGHTING AND POWER

O.,	Cleveland	May 4	Installing heating and ventilating apparatus in 3 schools	Clk., Board Education.
Mont.,	Helena	May 4	Installing ornamental lighting system, 391 posts	Wm. Jordan, Jr., C. Clerk.
N. J.,	Paterson	4 p.m., May 5	Furnishing lighting and maintaining arc lamps	Bd. Public Works.
Minn.,	Comfrey	7 p.m., May 5	Complete electric light plant	G. W. Schaffer, Vil. Clerk.
O.,	Norwalk	noon, May 5	Electric lighting system and current	A. W. Carpenter, Dir. P. S.
N. D.,	Grand Forks	May 7	Electric light fixtures	County Auditor.
Pa.,	Philadelphia	May 7	Contract for electric street lighting	Dir. Cooke.
B. C.,	Fernie	May 7	Complete tungsten street lighting system	J. E. Finn, Sup. Lt. & Power.
Panama		May 8	Motors, centrifugal pumps, switches, cable, wire, etc	Gen. Pur. Officer, Isthmian Canal Comn., Wash., D. C.
Wash.,	Okemogen	2 p. m., May 11	Furnishing electrical apparatus for project	O. H. Ensign, Engr., Los Angeles, Cal.
Mont.,	Lewistown	8 p.m., May 11	Installing street lighting system	H. L. Fitton, City Clk.
Mich.,	Ionia	May 12	Electric wiring in building	E. A. Boyd, Lansing.
O.,	London	Noon, May 12	Equipment for cluster lights	J. W. Byers, Village Clk.
Neb.	Bruning	May 12	Constructing electric light system, $7,308; also water system, cost $11,778	Village Clerk.
W. Va.,	Wheeling	May 13	Power house and machinery for dam	Maj. J. P. Jervey, Corps. Engrs., U. S. Army.
Ill.,	Sterling	May 15	Installing ornamental street lighting system, cost $9,015	A. J. Platt, Chr. Lt. Com.

FIRE EQUIPMENT

Wash.,	Puget Sound	10 a.m., May 5	Quantity of linen fire hose	Navy Dept., Washington, D. C.
La.,	New Iberia	6 p.m., May 5	Complete fire alarm electric system, consisting of 20 repeating alarm boxes, etc. (See proposal ad.)	J. P. Superbielle, Pur. Agt.
R. I.,	Woonsocket	May 5	1,000 ft. hose	City Clerk.
N. Y.,	New York	11 a.m., May 5	8,000 ft. 2½-inch unlined linen hose	K. B. Davis, Comr. Dept. Cor.
S. D.,	Yankton	8 p.m., May 11	One motor-driven combination hose, ladders and chemical	D. M. Doile, Chr. Jt. Com.
Ala.,	New Decatur	May 11	Furnishing combination chemical and hose	City Clerk.

BRIDGES

Ont.,	Cayuga	May 2	Concrete arch bridge	Township Council.
Tex.,	Houston	10 a.m., May 4	Constructing reinforced concrete bridge, 150 ft. long	H. L. Washburn, Co. Aud.
Va.,	Fairfax	11 a. m., May 6	Constructing 3 concrete bridges	Bd. Supervisors.
Ind.,	Marion	10 a.m., May 13	Constructing several bridges	Co. Comrs.
Mont.,	Butte	10 a.m., May 29	Constructing concrete or steel bridge	Bd. Co. Comrs.
N. Y.,	Charlotte	June 4	Constructing bridge, cost $75,000	Co. Comrs.

MISCELLANEOUS

Mass.,	Boston	11 a.m., May 2	Installing 3 motor 20-ton electric traveling crane	Navy Dept., Washington.
Ill.,	Chicago	11 a.m., May 2	Installing 140 extension brackets; 1 key seating machine.	L. E. McGann, Comr. P. S.
Pa.,	Harrisburg	Noon, May 2	600 gal. street sprinkler and two 2-horse street sweepers.	W. H. Lynch, Supt.
R. I.,	Providence	2.15 p.m., May 4	Furnishing crane at pumping station	Board Contract & Supply.
Ill.,	Chicago	11 a.m., May 7	Seven 5-ton auto flusher and oilers; two 5-ton auto dump wagons; one 2-ton auto truck	L. E. McGann, Com. P. Serv.
O.,	Cleveland	May 11	Retaining wall	Board Education.
Cal.,	Mare Island	10 a.m., May 12	Supplying multiple leaders, tubes, boilers, etc	Navy Dept., Wash., D. C.
O.,	Akron	May 14	Garbage reduction equipment	Director Public Service.
Conn.,	Waterbury	4.30 p.m., May 29	Constructing municipal building	City Hall Comn.
N. C.,	Rocky Mount	3 p.m., May 29	Constructing complete post office	Supv. Arch., Wash., D. C.

STREETS AND ROADS

Gadsden, Ala.—Ordinance for paving Forest Ave., 7th to 12th, passed. Estimated cost, $23,814.

Montgomery, Ala.—W. S. Keller, State Highway Engineer and President of Birmingham-Montgomery Highway Association, will shortly call meeting of association at Clanton to make further plans toward construction of highway between two cities.

Napa, Cal.—At meeting of Board of Supervisors resolution was passed favoring construction of Black Point State highway from Napa to Black Point and Sausalito. Board agreed to donate $65,000 and underwrite $25,000 worth of State highway bonds if Sonoma County will donate $75,000 and Marin County $35,000. This is on condition that State Commission will take over present county road from Napa to Solano County line and maintain it.

Sacramento, Cal.—State highway bonds to the amount of $260,000 have been sold by State Treasurer E. D. Roberts, $220,000 being purchased by Sonoma County and $40,000 by Tuolumne County. This leaves but $8,000,000 of original $18,000,000 issued remaining. Application has been made by Santa Barbara County for $400,000 in bonds and Los Angeles Supervisors have authorized purchase of a half million more.

Sacramento, Cal.—Bids for construction of 31.7 miles of roadway in Solano, Alameda, Kern and Ventura Counties entailing expenditure of approximately $218,317.70 have been opened by State Highway Commission as follows: Kern County, from the northerly boundary to Dearborn, 12.4 miles, to be built of Portland cement concrete; estimate, $48,789.20; materials furnished by the State, $59,264. Bids—Lynn S. Atkinson of Los Angeles, $48,110; Richard Rothwell of Los Angeles, $56,323; Taylor-Berliner of Los Angeles, $58,884. Alameda County, from Haywards to Oakland, 5.1 miles, to be surfaced with asphaltic concrete, estimate, $59,731.61; materials furnished by State, $2,158.40. Bids—Ransome-Crummie Co. of Oakland, $53,263.60; Clark & Henery Construction Co. of Sacramento, $62,677.60. Alameda County from Haywards to Valle Vista School, about 3.1 miles, to be built of Portland cement concrete; estimate, $24,163.57; materials furnished by the State, $18,819.71. Bids—Bates, Boreland & Avers of Oakland, $26,155; Tiesland Brothers of San Francisco, $19,538.05; Fred Leffler of San Francisco, $37,242.50. Solano County, from Benicia to a point two and a half miles south of Cordelia, about nine miles, to be built of Portland cement concrete; estimates, $60,969.55; materials furnished by the State, $43,911.21. Bids—Tiesland Brothers of San Francisco, $64,432; T. N. Burns of Sacramento, $79,280; Fred Leffler of San Francisco, $137,392.50; Dan O'Day Company of San Francisco, $79,055; Raisch Improvement Company of San Francisco, $113,310. Ventura County, from Sea Cliff to the westerly county boundary, about 5.1 miles, to be built of Portland cement concrete; estimate, $41,741.11; materials furnished by the State, $16,278.05. Bids—Carl Leonardt of Los Angeles, $43,911.35; Linn S. Atkinson of Los Angeles, $47,040.25; A. J. Ford of Los Angeles, $40,040.90; Leigh G. Garney of Los Angeles, $58,695.35; Modern Construction Company of Los Angeles, $35,516.35.

Bridgeport, Conn.—Resolutions for macadamizing streets have been presented by Aldermen Miller and Cole.

Bridgeport, Conn.—Paving of Fairfield Ave., from Clinton Ave. to State St., and from Main St. to Park Ave., and Park Ave., from State St. to Atlantic St., is under consideration.

Devon, Conn.—Improvement of Naugatuck Ave. fifty feet wide is under consideration.

Hartford, Conn.—Commissioner Bennett has summarized needs for renewing and repairing roads as follows: Repairs to trunk lines, not including automobile fees $500,000; renewals and construction of trunk lines, $500,000; State aid roads, $500,000; repairs to State aid roads, $150,000; engineering and operating department, $100,000; total, $1,750,000. For this fiscal term of two years twice this sum, or $3,500,000, will be required.

Hartford, Conn.—Bids were opened for 18,290 sq. yds. sheet asphalt, 13,400 sq. yds. asphalt resurfacing, etc. There were three bidders: Edward Balf Co., 89 cts. and 95 cts. per sq. yd.; the Barker-Bonner Co., at $1.15 per sq. yd. for new paving and $1.20 for resurfacing; the Union Paving Co., $2.04 per sq. yd. for new paving and $1.24 for resurfacing.

Stratford, Conn.—It is planned to present to town of Stratford proposition for opening of some new roads along Long Brook.

Georgetown, Del.—City Council has decreed that work of paving streets that were not ordered to be paved last year will have to be done this term.

New Castle, Del.—Halsey & Co., of New York, Philadelphia, Chicago and San Francisco, have purchased for $30,000 street improvement bonds of city of New Castle.

Wilmington, Del.—Levy Court has received bids for construction of five improved roads in New Castle County. Bids, based on roads being built of trap rock on both courses, are as follows:

For building improved road known as Milford Cross Roads-Newark Road, extending from Milford Cross Roads to Newark, distance of about 2 miles in Mill Creek hundred: Thomas R. Claringbold, $18,062.84; Standard Paving Corporation, $18,656.28; John A. Clark, $17,990; George F. Snyder, $17,868; D. Webster Anders, $16,397; D. E. Connell & Sons, $18,515.76; Allen Engineering Company, $17,969.15. For building improved road known as Valley Road, extending from Hockessin to North Star Schoolhouse, distance of nearly 2 miles in Mill Creek hundred: Thomas R. Claringbold, $20,765; Standard Paving Corporation, $20,935.50; B. F. Wickersham, $18,900; Corcoran Construction Co., $19,200; John F. O'Neal, $22,360; D. E. Connell & Sons, $17,792, and Alexander Petrillo, $26,698. For building improved road, known as Tybout Corner Road, extending from improved road near State Road Station on State Road to Tybout's Corner, distance of nearly 2 miles in New Castle hundred: Thomas R. Claringbold, $16,492.19; Standard Paving Corporation, $16,712.75; Alfred H. McDowell, $16,770; Juniata Paving Company, $16,200; D. E. Connell & Sons, $17,615.20; John A. Clark, $15,700. For building improved road known as the Clark's Corner-Bird's Corner Road, extending from Clark's Corner to Bird's Corner, distance of a mile and a quarter in Red Lion hundred: Thomas R. Claringbold, $12,240; Standard Paving Corporation, $13,113; Alfred H. McDowell, $12,263; John A. Clark, $12,000; Juniata Paving Company, $12,537. Bids will probably be awarded to lowest bidders.

Marianna, Fla.—Ordinance has been passed requiring the construction of cement sidewalks on all business streets.

St. Augustine, Fla.—Bonds in sum of $650,000 for brick roads will be sold by County Commissioners on May 10.

St. Augustine, Fla.—Ordinance committee has been instructed to prepare ordinances for paving several streets.

Huntington, Ind.—Petition asking for oiling and macadamizing of alley that forms north boundary line of Moore's addition and runs between Byron and Marshall streets, has been filed with Harry Young, City Clerk.

Vincennes, Ind.—Improvement of McKinley Ave., from Fairground Ave. to 14th St., has been ordered.

Muscatine, Ia.—Construction of about one mile and a half of concrete roadway is planned for vicinity of Columbus Junction.

Leavenworth, Kan.—Paving of South Esplanade is being discussed.

McPherson, Kan.—City Council will extend paving of Kansas Ave. to city limits, about half a mile.

Carlisle, Ky.—Committees report that sufficient money has been raised to build model road from Carlisle to Bath County line via Moorefield.

Abbeville, La.—Good road bonds in sum of $72,500 have been sold.

Covington, La.—Police jury has called election for June 3 to secure vote on proposed parish tax and $180,000 bond issue for construction of 200 miles of roads.

New Orleans, La.—Plans have been submitted for improvements of Audubon Park.

New Orleans, La.—Commissioner Lafaye has submitted ordinance approving plans, etc., for repaving two streets with creosoted block and one with asphalt.

Baltimore, Md.—A smooth street through Baltimore from east to west and one from north to south, both, as far as possible, free from car tracks, is tentative plan of State Roads Commission, which is spending large amount of money in city. Parts of such thoroughfare have already been completed by the state and contracts for more work to be done this year have been let.

Hagerstown, Md.—According to plans of E. R. Darby, superintendent of roads, county will build about 16 miles of model road in different sections of county this year at approximate cost of about $80,000. Distribution of road building will be for purpose of giving each section as much road improvement as possible.

Hagerstown, Md.—Washington County will build 16 miles of Model road this year at estimated cost of $30,000.

Beverly, Mass.—Board is in favor of City Council appropriating $40,000 for smooth paving of Rantoul St. providing that expenditure could be made without increasing tax rate.

Highlands, Mass.—Plans are being prepared for opening of new thoroughfare which will be known as Hamilton Ave. extension.

Springfield, Mass.—New highway is to be constructed from Dartmouth College grounds to Boston & Maine R. R. station.

Flint, Mich.—Between 150,000 and 200,000 square feet of cement sidewalk will be built in Flint this year, according to estimate furnished to council by City Engineer Shoecraft.

St. Joseph, Mich.—Board of supervisors has unanimously adopted resolution placing on market $40,000 worth of good road bonds to cover deficit caused by inability of state to pay rewards this year on highways through county for which contracts have been let for construction this year.

St. Joseph, Mich.—Council has decided to pave Lake Blvd. with macadam, tarvia or similar material.

Duluth, Minn.—City Council has agreed to appropriate $500 to pay half cost of constructing concrete culvert across 93d Ave., west, below Zimmerly Ave.

Cranbury, N. J.—Panther road, near Manasquan, has been taken over by the state and will be rebuilt.

Elizabeth, N. J.—Bids for oiling streets have been received from Standard Oil Company, Logan & Hathaway, Sands, L. Klein & Company and F. P. Morrison and have been referred to borough engineer and street committee.

Garwood, N. J.—Center St. is to be improved with macadam curb and gutter.

Garwood, N. J.—Property owners in Centre St. have expressed themselves to Borough Council as in favor of permanent improvement of that thoroughfare from North Ave. to Locust St. by remacadamizing roadway and laying cement curbs and gutters.

Jersey City, N. J.—Residents of Danforth Ave. and vicinity have petitioned Commissioners for widening of Danforth Avenue in accordance with provisions of street widening law of 1913.

Jersey City, N. J.—Board of Freeholders has authorized issuance of $100,000 worth of bonds, bids for bonds to be advertised for and to be received at next meeting, May 14. At same time bids for repairs and improvements to 14th St. viaduct, bids for $300,000 worth of county park bonds to run 50 years at 4½%, and bids for grading of the grounds between the court house and county jail will also be received.

Millville, N. J.—See "Sewerage."

New Brunswick, N. J.—Following roads are in bad shape, and will be repaired with aid of state moneys: Weston's Mills road to South River; St. George Ave., Perth Amboy to Rahway, which is poorest in county; Metuchen road, from Highland Park to Iselin.

Passaic, N. J.—William Hoehl, of Hillcrest Ave., Wood Rige, has been awarded entire issue of $20,000 5% 30 year street improvement bonds.

Perth Amboy, N. J.—Plans are being made for paving of Amboy & New Brunswick Aves.

Trenton, N. J.—Property owners on Princeton Ave. have petitioned board of freeholders to make improvements to thoroughfare from Spruce St., city line, to Harney's Corner, distance of about a mile.

Binghamton, N. Y.—Ordinance has been introduced authorizing issuance of $25,000 worth of bonds for paving purposes, bonds to be in denominations of $1,000 each.

Binghamton, N. Y.—Proposition before taxpayers to issue bonds to amount of $25,000 to do certain extra paving with this year will be carried according to indications.

Binghamton, N. Y.—The $25,000 pavement bonding election has been carried by majority of 592.

Cortland, N. Y.—Bids for repaving of Main St. will be opened May 11. Board has decided that vitrified brick or blocks with stone curbing shall be used.

Newburgh, N. Y.—Street committee of city council has taken decisive steps looking to permanent improvement of Newburgh's main southern approach. Committee will recommend to city council at its next meeting adoption of resolution for paving Quassaick viaduct at New Windsor approach to Mill St. at approximate cost of $4,000, County of Orange co-operating in work.

Ogdensburg, N. Y.—Board of Public Works is mapping out extensive programme for improvement of streets this summer, entailing expenditure of from $20,000 to $33,000. Amount which will be voted upon next month totals $33,474.90. Board plans to clean pavements and streets, improve outlying districts, lay 317 new crosswalks, provide for the repair of the River and Main St. bridges, pay half cost of new flusher, besides miscellaneous work.

Watertown, N. Y.—Division Engineer T. E. Ripley of state highway office has announced that in building Coffeen street road, this summer, road would be built of concrete on Coffeen street from railroad crossing to foot of the hill below fair grounds. He also said that among other roads to be built, brick would be laid on Mill street road and that on water bound macadam road to Cape Vincent road would be bricked in village of Dexter.

Williamstown, N. Y.—The Massachusetts Highway Commission has allotted to Williamstown sum of $4,000 for building of state road in Williamstown this year, sum to be placed with the $4,000 raised and appropriated by town at annual town meeting.

Raleigh, N. C.—Bond issue of $100,000 has been voted for street improvements.

Akron, O.—According to estimates furnished by City Engineer J. A. Gehres it will cost city approximately $11,268.70 to widen sidewalk on East Market St. from Wheeler Lane to railroad.

Dayton, O.—Bearing approval of State Highway Commission, plans for brick roadway improvement on Cincinnati pike, which were prepared by County Surveyor Victor C. Smith, have been sent to county commissioners for final action by that board. Stretch of brick roadway two and three-tenths miles long on Cincinnati pike in Van Buren township, south of the city, will be result of plans in event the commissioners pass favorably upon them. It is expected work will cost about $46,000.

Hugo, Okla.—Wilson Township, which embraces city of Fort Towson, is making arrangement to hold election for purpose of issuing $30,000 bonds for good road purposes. It is expected that Ratliff Township, which adjoins Wilson, will take similar action.

Portland, Ore.—Plans have been prepared for improvement of Hase Line road from city limits to Troutdale road. Estimated cost, $135,988.

Portland, Ore.—On recommendation of Commissioner Dieck all proposals for improvement of East Couch St. from East Sixth to East Twenty-fourth have been rejected and city auditor directed to advertise for new proposals.

Allentown, Pa.—Resolution has been passed inviting any or all oil companies bidding on specifications for oil for use of water department to make test of their goods, city agreeing to pay for oil used, not to exceed one barrel.

Beaver, Pa.—First road to be improved in Beaver County will be Bennett's new road. This road is about 2 miles long.

Chester, Pa.—Ordinance has been adopted for widening of Market St. in Marcus Hook.

Erie, Pa.—Ordinance has been adopted for improvement of various streets.

Erie, Pa.—Representatives of civic organizations in conference with City Council approved the revised plans by City Engineer Briggs for elimination of grade crossings and the erection of union station.

Lebanon, Pa.—Ordinance has been adopted to increase indebtedness of city to extent of $24,000 by issuing coupon bonds in amount of $14,000 to be used for purpose of paying cost of paving street and alley intersections.

Mill Creek, Pa.—Petitions are being circulated for a road from the city line of East Twelfth St. to Harbor Creek.

New Castle, Pa.—A new estimate of cost of widening and paving South Mill St. from Croton Ave. to Long Ave. has been presented to council by City Engineer Milholland. Estimate totals $24,960 of which greater portion will be borne by city.

Pottsville, Pa.—Ordinance has been introduced for paving West Market St., from Fourth to Twelfth.

Reading, Pa.—A bill to increase indebtedness of city to extent of $175,000 has been introduced at Wednesday's meeting of council by Superintendent McConnell of department of streets. Money is to be used for improved street paving.

Newport, R. I.—Senate has passed in concurrence with house act authorizing city of Newport to issue notes to amount of $72,000, for purpose of paying old notes, building new granolithic sidewalks and widening portions of Bath road.

Providence, R. I.—Officials of City Engineer's Department are hastening work of making estimates on cost of proposed 10-foot widening of Thayer St., between Angell and Waterman Sts, and report will be sent to committee on highways shortly.

Woonsocket, R. I.—Mayor has signed resolution appropriating $13,994 for highway construction work on Lyman St., Glen Rd., Page St., Slinton, Dewey,

Fairmount, Highland, Transit, Bernon and Elm Sts.

Woonsocket, R. I.—As result of concurrent action of city council and Mayor Daignault's approval, highway department has at its disposal appropriation of $13,000 for construction work in Glen road and other highways and $2,600 appropriation for working Summit St. to grade.

Ballinger, Tex.—City Council has authorized improvement of Phillips St.

Crandall, Tex.—Precinct No. 8, Crandall district, in special election has voted $150,000 in road bonds. Bonds carried by large majority.

Dallas, Tex.—County Commissioners' Court has rejected all bids for grading of Willingham road, extending for two and one-half miles along Mountain Creek, eight miles west of Dallas. Lowest bid received was 17c per yard. Commissioner Birt Britain has transferred Convict Camp No. 4 to Grand Prairie to begin work upon graveling new road four miles long from Grand Prairie southeast to Bryant ranch. Work will cost $8,000.

Terrell Tex.—Road bonds in sum of $300,000 have been carried.

Waco, Tex.—The $1,075,600 issue of road improvement bonds, voted month ago to improve 183 miles of road leading into Waco, have been sold for 97½ cents to the Harris Trust Company, of Chicago.

Lynchburg, Va.—Improvement of river road between Ninth St. bridge and Scott's mill has been planned.

Chehalis, Wash.—City Commission has contracted to sell $24,000 of street improvement bonds to Northern Bond & Mortgage Co., of Seattle.

Richland Center, Wis.—Bids received for laying four blocks of concrete pavement have been rejected. E. J. Lunenschlos is city engineer.

Sheboygan, Wis.—Bids will shortly be asked for paving Sheboygan-Sheboygan Falls road with concrete. Estimated cost is $48,000. C. U. Boley is city engineer.

Superior, Wis.—Iowa and Hughitt Aves. have been ordered paved with concrete.

Niagara Falls, Ont., Can.—City is to have improved highway from north to south end. City Solicitor McBurney has been instructed to prepare bylaw for pavement in Victoria Ave., from Magdalene St. to Ferry St., in Ferry St. from Victoria to Main St., and in Main from Ferry to Murray St. Pavement will be 44 ft. wide. According to Engineer Anderson pavement will contain 62,880 sq. yds., of which 11,485 yds. wil be laid by street railway company. Total cost of pavement will be about $173,454.

Niagara Falls, Ont.—Board of Works has adopted resolution recommending to City Council that Victoria Ave. be paved from Simcoe St. to Ferry st.; Ferry St. from Victoria to Main St.; and Main St. from Ferry St. to Murray St. Board has also recommended that Queen St. pavement which ends at Ontario Ave. be continued to Welland Ave.

CONTRACTS AWARDED.

Alexander City, Ala.—For 16,000 sq. yds. 4-ft. sidewalks to J. L. Mullarky, of Birmingham, at $1 per sq. yd.

Alexander City, Ala.—For laying 16.-sq. yds. of sidewalk, to J. L. Mullarky, Birmingham, at $16,000. J. G. Robertson is City Engr.

Hamilton, Ala.—Marion county board of commissioners in contract for construction of 23 miles of pike road. Road will be built to Hackleburg, running northeast from Hamilton across Buttahatchie river and will be distance of about 18 miles. Five miles of road will be built west of Hamilton toward Barnesville. Jordan & Phillips, road contractors of Aberdeen, Miss., were successful bidders, and they were awarded both state and county contracts. Sum of $42,000 approximately will be spent in construction of these pikes.

Paragould, Ark.—To C. A. Willison of Chicago, Ill., at $115,000 for 60,000 sq. yds. of paving, by Paragould Paving District.

Delevan, Ill.—To J. K. Rhoades of Lincoln, contract for paving number of streets at $57,626.

Crown Point, Ind.—To Nejde & Greenwald, of Whiting, Ind., at $17,300, for gravel road in North.

Indianapolis, Ind.—By Board of Park Commissioners, contract to Frantz Keller to construct walks and drives, as well as steps, in Noble Pl., at Prospect St. and Madison Ave. Work will cost $941.

Indianapolis, Ind.—Board of Park Commissioners has awarded contract to Marion County Construction Co. for paving 38th St., from Capitol Ave. to Fall Creek, with asphaltic concrete. Contract price is $110,925. There were several lower bids, although there was only one lower bid on kind of asphalt that board decided should be used. Other bids on work were as folows: Marion County Construction Co., using Texaco asphalt, $106,525; American Construction Co., using Montezuma, California or Texaco asphalt, $103,850, or using Trinidad or Burmuda asphalt, $107,840; Carter Construction Co., using California asphalt, $108,-801.48; Republic Construction Co., using Texaco asphalt, $108,885; E. V. Bergen, using Texaco asphalt, $107,809.91, or using Trinidad or some equally good native asphalt, $112,844.63, and W. K. Cooper, of the Union Asphalt Construction Co., Texaco, Cubanal or Trinidad asphalt, $112,500. Board said it believed that Trinidad asphalt should be used for work, and that it regarded Trinidad bid of Marion County Construction Co. better than bid submitted by lower bidder on that kind of asphalt. Under law Board may award contract to lowest and best bid.

Kokomo, Ind.—J. C. O'Connor & Son, the Delphi contractors, will build the Ulsafer road at $10,295.

Terre Haute, Ind.—To Daniels and Lyst of Anderson, Ind., $90,000 paving contract.

Anamosa, Ia.—To O. P. Hanssen, of Monticello, Ia., at $1.90 per cu. yd., for 1,000 cu. yds. crushed rock for Monticello and Cascade road.

Lancaster, Kans.—To Wm. Hollands, city, at $0.32 per cu. ft., for construction of 6 concrete street crossings.

Louisville, Ky.—Contracts for thirty-four pieces of sidewalk construction, amounting to about $8,000, have been awarded by Board of Public Works. Sidewalks are to be constructed of concrete. Eleven pieces of work were awarded to American Concrete Construction Co.; twelve to Roscoe Butler; six to Edwin S. Larson, and five to L. R. Figg Co.

New Orleans, La.—Highway Department of Board of State Engineers has received and opened bids for construction of following named highways located in Bossier Parish: Shreveport-Homer Highway—J. N. George & Sons, Shreveport, $25,212.50; Worthington Construction Co., Brookhaven, Miss., $32,-339.25; A. E. Perry Co., Mobile, Ala., $27,-094; Wetzel & Co., Danville, Ill., $28,885, and F. C. Barbour, Shreveport, $35,402. Bossier City-Benton Highway—J. N. George & Sons, Shreveport, $42,865; Healy Construction Co., Meridian, Miss., $39,-792; Wetzel & Co., Danville, Ill., $44,010; S. A. Gano, Jackson, Miss., $39,700; A. E. Perry & Co., Mobile, Ala., $42,360; Worthington Construction Company, Brookhaven, Miss., $45,902, and H. J. Bonnabel, New Orleans, $44,050. Bossier City-Ninoch Highway—Worthington Construction Co., Brookhaven, Miss., $88,219; Wetzel & Co., Danville, Ill., $79,420; S. A. Gano, Jackson, Miss., $88,175; A. E. Perry & Co., Mobile, Ala., $80,969. All bids submitted for construction of Shreveport-Homer highway were rejected. This project will be readvertised and bids will be opened May 18. Contract for construction of the Bossier City-Benton highway was awarded to S. A. Gano, of Jackson, Miss. Contract for construction of Bossier City-Ninoch highway was awarded to Wetzel & Co., of Danville, Ill.

Hagerstown, Md.—Contract has been awarded to Bester & Long for mile of road to be built from Spielman's to Fairplay at bid of $1,785.

Beverley, Mass.—John C. Fowler was given contract for laying of brick sidewalks about city by Public Service Committee at $2,323.83.

Concord, N. H.—For paving streets in Hooksett and Bedford, to New England Contracting Co., Worcester, Mass., at $5,566. Other bidders were Fred E. Ellis, $5,579; Antonio Pallatto, $7,256, and Small & Ingalls, $8,662.

Passaic, N. J.—Lizzo Construction Co. was awarded contract for grading Van Riber Ave. and constructing Sullivan St. sewer.

Albany, N. Y.—By State Roads Contracts Nos. 1148, 5448 and 5467, to Rhody & Clawson, Albion, at $67,106, $68,260 and $94,244 respectively.

Batavia, N. Y.—To Thomas Fitzgerald, of Buffalo, for paving East & West Main Sts.

Glens Falls, N. Y.—Common Council has awarded contract for oiling 240,000 sq. yds. of city streets to Standard Oil Co. Contract price is 1¼ cts. per yd.

Syracuse, N. Y.—By Board of Contract and Supply, to American Car Sprinkler Company, contract for sprinkling streets where street cars are laid.

Ellendale, N. D.—By city to Gates & Waite, Ellendale, for constructing cement sidewalks during 1914 at 10 cts. per sq. ft.; crosswalks, 15 cts. per sq. ft.

Columbus, O.—Contracts for construction of approximately twenty-four miles of road in Muskingum and Licking Counties have been awarded to H. E. Culbertson Company of Cleveland at $436,017. Contract was let by the State Highway Department.

Kenton, O.—By Harding County Commissioners, to Charles Sousley and Claud Britton, for constructing Humphreys Pike, at $23,800.

Springfield, O.—To W. F. Payne, at $35,129, for paving of West Pleasant St., with asphaltic concrete.

Toledo, O.—For improvement of Rock Hill and Brooks Run Pikes, to Siegle & Wolfe Co., Toledo, at $50,000.

Allentown, Pa.—Contracts have been awarded as follows: For furnishing "crushed trap rock," to the General Crushed Stone Co.; for "street grading," to the Weaver Contracting Co.; for "construction and repairs of street crossings," to the Allentown Construction Co.; for "curbing and paving in front of private property," to the Weaver Contracting Co.; for "furnishing crushed stone for the repairs of the various streets in the city," to Francis J. Newhard; for "furnishing one car of 8,000 gallons Aeztic Brand dust layer," to the United States Asphalt Refining Co.; for "furnishing the water department with corporation cocks for 1914," to the Mueller Mfg. Co.

Kane, Pa.—For paving Greeves St. to P. B. Colgan, Dunkirk, N. Y., at $8,787. Other bidders: Red Bank Constr. Co., Punxsutawney, $11,885; D. D. Dugan, Olean, N. Y., $10,148; Fugate & Hutchinson, Olean, N. Y., $11,076; E. M. Love & Son, Corry, $11,112; Applegate & Bryce, Olean, N. Y., $11,585; Larson & Wilson, Kane, $13,281. Thos M. Palsey is Boro. Secy.

Kingston, Pa.—To B. G. Coon, Union St., Dorranceton, at $17,200, for 5,500 sq. yds. of brick paving and 2,100 lin. ft. of curbing on Market St.

Pittsburgh, Pa.—County Commissioners have let contracts to furnish material to repair practically all of old macadamized roads in county. It is estimated that there will be about 30 miles of repair work.

The Pittsburg Amiesite Co. has been awarded contract to furnish approximately 16,900 tons of asphaltic concrete, at prices from $8.10 to $8.75 a ton, according to the distance it is to be hauled. Contract aggregates about $135,000. Donald McNeil Co. was given contract for furnishing 10,500 tons of asphaltic concrete at cost of $93,000, or from $8.64 to $8.89 a ton, according to haul.

Contract for 2,200 tons of ballast at $1.25 a ton was awarded to Clydesdale Stone Co., to be delivered to Red Raven, for use on the Little Deer Creek Valley road. For hauling of this ballast from Red Raven to various points where it is to be used L. Z. Hodil was given contract at 57 cts. a ton. A contract for 1,300 tons of Kentucky rock ballast for use on this road was awarded to D. H. Crissman at $8.99 a ton, delivered.

Contract for 2,000 barrels of Portland cement was awarded to Crescent Portland Cement Co. at $1.19 to $1.48 a ton, according to place of delivery.

Utica, N. Y.—Harry W. Roberts & Co. have received contracts for paving sections of five streets. His prices were for sheet asphalt, $1.35; bitulithic, $1.55; asphaltic concrete, $1.35, and vitrified brick, $1.90.

Wilkinsburg, Pa.—To Ott Bros. Co., 414 Washington St., Pittsburgh, Pa., at $8,-887.64, for approximately 10,000 cu. yds. grading 4,600 sq. yds. paving and 2,500 lin. ft. curb.

Newport, R. I.—Communication has been received from the street commissioner, enclosing three bids for asphalt for work on streets. Commissioner has recommended acceptance of bid of Warner, Quinlan Asphalt Company, at 11.75 cents a gallon in a barge. Quantity to be used is about 71,000 gallons, or about 300 tons. In his opinion this asphalt will give best satisfaction. Company agrees to send expert to give city pointers on what has been found to be best way to lay such roadbeds. This he believed would be worth having. Bids were: United States Asphalt Refining Company, called American Asphalt Company, 10 cents a gallon; Warner, Quinlan Asphalt Company, 12.5 cents by car, 11.75 by barge; Barber Asphalt Paving Company, 12.5 cents. Taking 71,000 gallons as total bids figure out as follows: American, $7,100; Warner, Quinlan, $8,342.50; Barber, $8,875.

Chattanooga, Tenn.—Committee on streets, J. F. Rafferty, chairman, awarded contract for laying concrete sidewalks to Simons & Mayrant Co., at 89 cts. per sq. yd.; flagstone sidewalks, James Begley, 45 cts. per sq. yd.

Nashville, Tenn.—Contracts for paving 42 streets under abutting property tax provisions of city charter have been awarded by Board of City Commissioners on recommendation of J. Morgan Wilkerson, Commissioner of Streets, sum of bids specified in these contracts being $457,134.21. In each instance lowest legally accepted bid was accepted. Bids for improvement of 45 streets and alleys were received by board, but lowest bids submitted for paving Broadway from 16th to 21st Aves., and Alley No. 62½, exceeded estimates, and therefore no contracts were awarded for these highways. On recommendation of Commissioner Wilkerson board also rejected all proposals for improving Alley No. 27½, 3d to 4th Aves. For wood block paving L. R. Figg was low bidder on one contract at $8,250.96, and So. Asphalt & Const. Co. was low bidders on other contracts at total of $40,359.40 for plain blocks and $42,288.88 for kreolite blocks. For bitulithic paving low bidder was So. Bitulithic Co., at total of $171,568.72. For granite paving the Adamant Stone & Roofing Co. was lowest bidder on three contracts at total of $39,827.98, and R. L. Proctor Co. on three contracts at total of $20,803.40. For vitrified brick paving, the L. R. Figg Co. was low bider on one contract at $2,860, and So. Asphalt & Const. Co. was low bidder on other contracts at total of $96,362.58. For bituminous macadam paving low bidder was Uncle Hiram Roofing Co., at total bid of $37,257.30.

Dallas, Tex.—For paving and improving 1st St., in Trinity Heights, Summitt, to Seay, Cranfield & Co., at $150,000. J. M. Preston is City Engr.

Houston, Tex.—Bermudez asphalt concrete was selected as material for paving of McGowan from Main to Milam. Contract for work was awarded to the Roach-Manigan Co., and appropriation of $3,500 was made to cover cost of construction.

Salt Lake City, Utah.—For construction of 20,000 sq. yds. of asphaltic pavement, to J. W. Mellen, Salt Lake City, at $132,260. Other bidders were: G. A. Heman, $141,515; P. J. Moran, $151,614, and Strange-Maguire, 62,848. S. Q. Cannon is City Engr.

Fairfax, Va.—For graveling 32 miles highways in Mt. Vernon Dist., Fairfax County, by County Bd. Supervs. to Berkley & Smith, of Richmond, at about $97,000.

Norfolk, Va.—For 25,000 yds. smooth pavement in River View Section and Highland Park to Louis Lawson, at $38,-984.

Ephrata, Wash.—To A. H. Zane & Co., of Hanford, Wash., at $15,875, for paving of permanent highway No. 5.

Mt. Vernon, Wash.—To D. H. Traphagen, Arctic club, Seattle, Wash., at $27,000, for the construction of Permanent Highway No. 3 in Skagit County.

Seattle, Wash.—To L. C. Lane, Hinckley Bldg., at $44,930, for C. L. Morris road, including 71,361 cu. yds. of excavation; 129,724 cu. yds. of overhaul; 47 cu. yds. of concrete; 2,672 lbs. of reinforcing steel; 425 ft. porous tile; 1,368 ft. tile pipe; 1,368 ft. cement or concrete pipe; 8,667 yds. crushed rock.

Seattle, Wash.—To Geo. A. Bandarett, Renton, Wash., at $14,718, for construction of Kirkland-Median road.

Milwaukee, Wis.—F. P. Coughlin, of Chicago, was successful bidder on large portion of asphalt paving work contracted for by city. The paving jobs on seventeen streets, which will cost $156,700, went to three contractors, and Coughlin received contracts amounting to $66,000. His contracts are following: Cramer St., from Park Pl. to Linwood Ave., $11,258; Lake Drive, from Bradford St. to Park Pl., $15,643; Bremen St., from North Ave. to Hadley St., $31,983; Achillas St., from Burleigh St. to Concordia Ave., $9,605.

About half of work was secured by Badger Const. Co., its contracts being the following: 44th St., from Lisbon Ave. to Elm St., $5,473; Broadway, from Knapp St. to N. Water St., $10,805; Galena St., from 48th to 49th Sts., $2,208; 54th St., from Washington Blvd. to Vine St., $6,033; Vine St., from 47th to 48th Sts., $1,648; 51st St., from Vine St. to Pabst Ave., $4,307; Pabst Ave., from Mount Blvd. to 42d St., $5,765; 52d Ave., from Vine St. to Pabst Ave., $4,293; Center St., from 8th St. to Teutonia Ave., $13,168; Louis Ave., from Lee to Center Sts., $9,740; 5th St., from Galena St. to Reservoir Ave., $11,460.

The White Construction Co. received contracts for paving of O'Dell St., from 8th Ave. to 11th Ave., $5,734, and National Ave., from 32d Ave. to Trowbridge Ave., $6,776.

Milwaukee, Wis.—To White Construction Co., city, at $11,377, for paving with asphalt of Cramer St., Park Pl., to Linwood Ave., also National Ave., 32d Ave. to city limits, $6,776, and Odell St., Eighth to 11th Aves, $5,734.

Neenah, Wis.—Three thousand feet of concrete road will be built between Appleton and Menasha this season. Herman Wildhagen has contract for construction of highway.

SEWERAGE

Lodi, Cal.—Surveys of East Pine St. are now being made preparatory to installing storm sewers, city trustees having instructed City Engineer Barzelotti to proceed with work, which, it is estimated, will cost $1,700.

Bridgeport, Conn.—Need of better sewer facilities is being discussed.

Daytona, Fla.—Bids will be received by Board of Public Works of Daytona until 2 p. m., May 5, 1914, for purchase of $125,000 of Gold 5 per cent. sewerage and drainage bonds.

Joliet, Ill.—Sewer will be constructed on Raynor Ave.

Winchester, Ind.—Contract for sewer on North Main St. to Benjamin Yost at $3,258.

Keokuk, Ia.—City Council has passed resolution instructing city clerk to advertise for bids for construction of egg-shaped sewer, approximately 230 ft. long, to run through lots 7, 8, 9, 10 and 11 of Reeves, Perry and Williams' addition, to run to present sewer in High St., just west of 17th St., to connect with brick egg-shaped sewer under 18th St., just north of High.

Mason City, Ia.—City is planning for expenditure of $90,000 for extension of sewer system and for installation of sewage disposal plant.

Dunkirk, N. J.—Plans for Newton St. sewer, completed by City Engineer Shelton some time ago and submitted to state board of health, have been approved. Proposed sewer will extend from Washington Ave. to Lion St. with a 52-foot branch in Washington Ave.

Linden, N. J.—Citizens of Greater Elizabeth have petitioned for a sewer with branches and laterals.

Millville, N. J.—Ordinance providing for issuing of $43,000 worth of bonds for following improvements, introduced at meeting of March 27, has been adopted: $19,000 for construction of storm sewer on Second St.; $3,000 for improvement of sewage disposal plant; $2,000 for installation of police and fire alarm system; $5,000 for purchase of auto chemical fire engine; $10,000 for repair of streets and roads; $3,000 for building of fireproof vault to City Hall.

Buffalo, N. Y.—City Council has authorized construction of 12-in., 15-in. and 18-in. tile sewers on Alvin Ave., and 30-in., 33-in. and 36-in. sewers on Montrose Ave.

Dunkirk, N. Y.—Resolution has been adopted that City Engineer Shelton be authorized and directed to proceed with formation of suitable plans for intercepting sewer system as recommended by State Health Department, and that City Engineer be empowered and directed to secure all necesary engineering instruments and to engage necessary labor to proceed with this work.

Middletown, N. Y.—Johnson & Fuller, engineers, are preparing plans for construction of sewage disposal plant at cost of about $100,000.

Warsaw, N. C.—See "Lighting and Power."

Salem, O.—Ordinance has been adopted for construction of sanitary sewers in West Main St.

Xenia, O.—Xenia will have to build sewage disposal plant at once, in compliance with action of state board of health. By order of state board necessary bond issue can be made without vote of people. Bond issue will probably amount to between $25,000 and $30,000. It is probable that different style of disposal plant will be built on site of present plant.

Eugene, Ore.—That work upon complete storm sewer system for Fairmount will begin in very short time is statement made by W. A. Bell, chairman of sewer committee. First unit of this system, which will cost about $39,000, according to estimates of city engineer's force, will include big drain on Agate St. from mill race as far back as 19th Ave. east and possibly to 20th Ave. or further.

Erie, Pa.—Ordinance has been adopted for construction of sewers in various streets.

Woonsocket, R. I.—Sewer Commission will have approximately $30,000 to spend for construction work. City Council has appropriated $12,000 for two new filter beds, which are made necessary for increasing amount of sewage, and has also appropriated $18,379 for building sewers in Dulude and Carrington Aves. and Elm, Grand, Logee, Grove and River Sts.

Woonsocket, R. I.—Mayor has signed resolution providing for sewers in various streets.

Sioux Falls, S. D.—Resolution has been adopted for construction of sanitary sewer on Minnesota Ave.

Nashville, Tenn.—Petition signed by citizens of Woodland and Main Sts. for construction of new sewer will be presented to board of City Commissioners.

Austin, Tex.—Attorney general's department has approved two issues of city of Houston Heights bonds, one of $200,000 sewerage bonds, payable serially, and other of $20,000 public improvement bonds, maturing in 30 years.

Galveston, Tex.—Bids have been opened for the pipe, fixtures, etc., which are to be used in extension of waterworks and sewer of the city. Bids were referred to Commissioner Shay for tabulation and report. Following are bids on material for sewer extension: A. C. Falligant—7,630 feet of 8-inch pipe complete, 48 cents per foot; 1,080 feet 10-inch pipe complete, 62 cents per foot; 330 feet 12-inch pipe complete, 90 cents per foot; 9,040 feet running board, 2 cents per foot; 25 manholes, $25 each. P. J. Vautrin's bids on these items were: 61 cents, 74 cents, 89 cents, 2 3-4 cents and $24, respectively. H. C. Goss of Houston bid 61 cents, 75 cents, 95 cents, 3 cents and $25 on the different items. Truehart and Jackson of San Antonio offered bids of 44 cents, 50 cents, 60 cents, 2 1-2 cents and $20, respectively. Fruend and Quay's bids on the different items were: 47 cents, 56 cents, 65 cents, 4 cents and $37.50.

Sheboygan, Wis.—Several small sewers will be laid.

CONTRACTS AWARDED.

Los Angeles, Cal.—To John Radich, at $59,432, for construction of Maple Ave. main sewer, between Seventh St. and Washington St., by board of public works, and to J. C. Duncan, at $60,750, for construction of sanitary sewer in Catalina St. district.

San Francisco, Cal.—For sewer system in Junipero Dist. to State Improvement Co., San Francisco, at $21,165. Other low bidders: Contra Costa Contr. Co., $22,995; F. Rolandi, $23,193; J. H. Belser, $22,244.

South Pasadena, Cal.—To R. N. Nikcevich, 611 Loughlin Bldg., Los Angeles, for sewer system at $51,476. Olmsted & Gillelen, Hollingsworth Bldg., Los Angeles, all engineers.

Fort Lupton, Colo.—To Gordon Taylor Construction Co., of Denver, at $13,790, for installation of sewer system.

Hartford, Conn.—Report was made to the Board of Contract & Supply on the bids submitted by the contractors on the Maple Ave. sewer last week. Sections A and B were awarded to O'Neil Bros. on the following basis: Section A, $51,-389.60; section B, $8,928.10. Total, $60,-317.70; Section C, Ryan Construction Co., of New Haven, $31,463.20. The contracts were awarded to the contractors named.

Atlanta, Ga.—To Gysard Construction Co., at $8,912, for construction of two miles of sewers.

Angola, Ind.—To Van Derwelle Bros., of Grand Rapids, Mich., at $22,679, and Moritz & Lybarger, city, at $12,490, for construction of about 21,000 lin. ft. of 30, 24, 20, 18, 15, 12, 10 and 8-in. pipe sewer.

Farmland, Ind.—Contracts for large sewer ditch have been awarded to Portland Tile Co. for tile and to Russel Yost for construction.

Baltimore, Md.—For sanitary contract No. 133 to C. B. Clark & Co. of Baltimore at $118,682.68.

Otsego, Mich.—To Payne & Curry, at $8,702, for building of 8,305 ft. of 6 and 8-in. sewer.

Stillwater, Minn.—For construction of Judicial Ditch No. 3, in Anoka and Washington Counties, to Ewing & Brockenbrough of Lafayette, Ind., they being lowest bidders. Amount of contract is $13,040.16.

Newark, N. J.—Contracts have been awarded by Passaic Valley Sewerage Commission for construction of Section No. 13 of big flume, in Passaic, and also for construction of siding from Bay Shore Railroad on meadows to sewer pumping station. Awards were made to those who sent in lowest bids April 14. For sewer section work contract was given to Carrington Construction Co., of Jersey City, for $252,202.50. Construction of siding was given to New York & New Jersey Construction Co., of this city, for $15,000.

Newark, N. J.—To Carrington Construction Co., of Jersey City, at $252,203, for construction of Section 13 of trunk sewer for Passaic Valley Sewerage Commission.

Passaic, N. J.—Following are prices bid for sewer and house connections in Brook Ave.: (1) Union Bldg. & Const. Co., Passaic; (2) De Vogel Contracting Co., Wallington, N. J.; (3) J. T. Harrop Co., Garfield, N. J.; (4) Maybury Eng. & Cont. Co., Clifton, N. J.: 8-in. sewer, (1) 25 cts., (2) 25 cts., (3) 27 cts., (4) 23 cts.; 6-in. house conections, (1) 20 cts., (2) 20 cts., (3) 21 cts., (4) 17 cts.; manholes, each, (1) $40, (2) $50, (3) $65, (4) $50; flush tanks, 1) $85, (2) $90, (3) $90, (4) $90; rock trench, (1) 26 cts., (2) 26 cts., (3) 25 cts., (4) 25 cts.; trench under 8 ft., (1) 50 cts., (2) 55 cts., (3) 50 cts., (4) 50 cts.; trench under 10 ft., (1) 65 cts., (2) 70 cts., (3) 75 cts., (4) 75 cts.; trench under 5 ft., (1) 40 cts., (23 38 cts., (3) 30 cts., (4) 30 cts.; trench under 7 ft., (1) 45 cts., (2) 45 cts., (3) 47 cts., (4) 40 cts.; altering old flush tank, etc., (1) $25, (2) $20, (3), $10, (4) $15; totals, (1) $2,632, (2) $2,703, (3) $2.804.80, (4) $2,506.20.

Princeton, N. J.—To Achilles Carnevale, city, sewer at $1,709. For sewer pipe to Reardon Co., $1,278.

Brooklyn, N. Y.—Awards have been made for 7 sewer contracts in Queens, total of lowest bids amounting to $32,-288.64. Principal contract was for 858 ft. of 4-ft. 9-in. reinforced concrete main and 598 ft. of 3-ft. 6-in. by 2-ft. 4-in. egg-shaped concrete main in Harsell St., from the East River to Hamilton St., and in Hamilton St., from Harsell St. to Paynter Ave., Long Island City. Successful bidder was Coleman Contracting Co., and amount of bid was $25,543.79. Evergreen Construction Co. is to build sewer in Newtown Road, Long Island City, from 13th Ave. to 18th Ave., for $2,823. Peace Bros. will build receiving basins at the northeast, northwest and southwest corners of Thomson Ave. and Court St., Long Island City, for $1,336.48, and temporary receiving basins on the southeast corner of 19th St. and Bayside Ave., and on the southwest corner of 19th St. and 14tn Ave., at Whitestone, at a cost of $349.87. Gabriel Hill will construct 543 ft. of 12-in. main and 450 ft. of 6-in. in 12th Ave., Long Island City, from Vandeventer to existing sewer about 475 ft. south of Wilson Ave., for $1,234.50. Charles A. Meyer Constructing Co. will build receiving basins at the northeast and northwest corners of Myrtle Ave. and Woodbine St., Ridgewood, for $385. There were 40 bidders on various undertakings.

Elmira, N. Y.—For sewer construction, to Manning & Strecker, Troy, at about $12,000.

Rochester, N. Y.—Myers & McWilliams are low bidders on Imhoff plant at $35,-855. Contract will shortly be awarded.

Watertown, N. Y.—For construction of Davidson St. sewer to Cooley & Allard at $1,353.

Piqua, O.—For sewer construction, to Charles F. Smith Co., Dayton, at $6,603.

Altoona, Pa.—Director F. E. Rooney, of Department of Streets and Public Improvements, has opened bids for construction of sewer in 25th St., between Second and Third Aves. The Saupp Co.'s bid was $1.25 per ft., while Loomis & King's bid was 82 cts. per ft. Mr. Rooney awarded contract to latter firm, subject to approval of council.

Archbald, Pa.—To McConville & Fitzpatrick, 135-137 S. Main St., Pittston, for 4½ miles of sewer, to consist of 30, 24, 20, 15, 12, 10, 8 and 6-in. connections, at $44,500. Jos. Murphy is Engr., Dunmore.

Ellwood City, Pa.—By sewer committee of council for sewer contracts to Meneice and Brennen, a local firm, at $1,598.01. Contractors will rush the work to completion. Sewers included in contract are on Larence and Franklin Aves.

Reading, Pa.—For constructing vitrified and iron pipe sewers as follows: To Fehr & O'Rourke, Reading, Contract 1, about 4,440 lin. ft. 20, 18 and 15-in. vitrified pipe, 41 catch basins and 150 vert. ft. mannoles, $16,761, and to Cantrell Constr. Co., Philadelphia, Contracts 2 and 3 at $37,436 and $36,357, respectively. Two contracts include 18,900 ft. 24, 20, 18 and 15-in. vitr. pipe sewers; 225 catch basins and 750 vert. ft. manholes. E. B. Ulrich is City Engr.

Houston, Tex.—To Horton & Horton, lowest bidders for construction of storm sewers on Elgin from Louisiana to San Jacinto and on Francis from Milam to Louisiana. Sum of $12,000 was appropriated to cover cost of construction. F. D. Horton & Son were lowest bidders for construction of storm sewers on Crawford from Capitol to Walker. Appropriation of $2,000 was made for this work. F. D. Horton & Son were also lowest bidders for construction of storm sewers on Hadley and Gray, from Smith to Travis. Sum of $7,500 was appropriated to cover cost of construction. Horton & Horton received contract for construction of storm sewers on Anita, from Milam to Fannin and on Tuam from Fannin to San Jacinto. Appropriation of $7,400 was made to cover cost of work. H. C. Gass received contract for construction of storm sewers on Louisiana, from Lamar to Bell.

Seattle, Wash.—To Holt & Jeffery, at $58,657, for filling River Park.

South Bend, Wash.—For constructing sewers to Andrew & Harrer, Portland, Ore., at $7,984.

Chippewa Falls, Wis.—To P. L. McQuillan, city at $9,400, for construction of Main St., Southside sewer.

Menomonie, Wis.—For sewer construction, by Board of Public Works to Kircher Bros., St. Paul, Minn.

WATER SUPPLY

Ozark, Ala.—Bond issue of $25,000 has been voted to increase water and light plant.

Orland, Cal.—Election will be held May 5 for voting on bond issue of $15,000 for water and sewer extension.

Indianapolis, Ind.—Water Company has been ordered to extend mains on a number of streets.

Esterville, Ia.—City Council is considering expenditure of $50,000 for improvement of water system.

Nauvoo, Ia.—City has taken over $35,-000 water works system put in by P. T. Kiernan's Co. New 75-ft. standpipe will probably be erected.

Slater, Ia.—Citizens have voted $10,000 bonds for water works. Engineer is C. W. Roland, Des Moines.

Valley Junction, Ia.—Engineers will drawn plans for improvements estimated to cost $40,000. C. C. Williams is City Clerk.

Peabody, Mass.—Installation of 500 meters is being considered. A. Jacobs is Supt.

Lansing, Mich.—About 1,000 meters may be installed this year. C. D. Dodge is Supt.

Duluth, Minn.—City Council has approved $36,500 of new work recommended by water and light department for present season. Chief among these is extension of water mains from New Duluth to Gary, estimated at $15,000 to $20,000. Probably next in importance is erection of steel water tower and tank at Woodland, which will furnish water supply for Orphanage system. Considerable other work will be done this season in addition to that ordered. This includes duplication of 1,000 to 2,-000 feet of big force main from Lakewood pumping station to city, for which pipe and other equipment has been contracted; improvements for Woodland system; probable installation of another electric pump at Lakewood, estimated at $20,000; completion of 10,000,000-gal. concrete reservoir for middle system, and numerous extensions.

Minneapolis, Minn.—It is proposed to install about 3,500 meters.

Ord, Neb.—At special election Ord voted $2,300 bonds water works extension and municipal electric plant.

Nashua, N. H.—Water service is to be improved on Monroe St. Extension calls for about 400 ft. of 3-in. pipe.

Jersey City, N. J.—Specifications have been presented for bids for making test borings in Hackensack River for water tunnel which is planned to carry duplicate pipe line from Boonton reservoir.

Keyport, N. J.—Ordinance providing for issuing of improvement certificate bonds to pay cost of repairing of water plant has been passed at first reading. It provided for raising of $10,000.

Pompton Lakes, N. J.—Citizens have approved of $55,000 in bonds for water works. Engineer is Jos. B. Rider, 26 Broadway, New York.

Red Bank, N. J.—Matter of laying about 600 ft. of water pipe from Broad St. to Hudson Ave. on Bergen Place and about 1,000 ft. on Bridge Ave., from Catherine to Beach Sts., has been referred to water committee for investigation.

Manchester, N. Y.—Charles C. Hopkins, Cutler Building, Rochester, is preparing plans for construction of municipal water system at cost of $40,000.

Durham, N. C.—Bonds in sum of $500,-000 for purchase of water works have been voted.

Warsaw, N. C.—See "Lighting and Power."

Dayton, O.—Proposals for furnishing meters for water department have been opened, there being five bidders as follows: Worthington Meter Company, New York; Buffalo Meter Company, Buffalo, N. Y.; Thompson Meter Company, Brooklyn, N. Y.; Pittsburgh Meter Company, Pittsburgh, Pa.; Union Meter Company, Worcester, Mass. Contract involves approximately $9,000, Union Meter and Buffalo Meter Companys' bids being so nearly uniform that it will require tabulation of bids by engineering department to determine which is the lower. Specifications call for 1,000 five-eighth-inch, 100 three-fourth-inch, 50 one-inch, 10 one and one-half-inch and 10 two-inch meters.

Youngstown, O.—C. P. Fortney, of Louisville, Ky., will have charge of construction of dam at Milton reservoir for new water supply. Estimated cost with land, $2,000,000.

Percy, Okla.—Bonds in sum of $25,000 have been voted for construction of water system. J. G. Cronin is Engr.

Shippensburg, Pa.—John E. Coffey, Borough Clerk, is inquiring for quotations on 18,000 to 20,000 ft. of iron and wood pipe, for use in laying new water main.

Shippensburg, Pa.—John E. Coffey, Clerk of Borough, is asking for quotations on 18,000 to 20,000 ft. of iron and wood 10-in. pipe for use in laying new water main.

Tamaqua, Pa. — Town Council is planning for construction of 300,000,000-gal. reservoir for water system, to cost about $100,000.

Woonsocket, R. I.—Mayor has signed resolution appropriating $12,000 for two new filter beds.

Nashville, Tenn.—Bids will shortly be opened for laying 9,750 ft. of 6-in. water mains on several streets.

Galveston, Tex.—Following are some of the bids received for water works extension: United States Construction Iron Pipe and Foundry Company for 8-inch cast iron pipe, $22.50 per ton. Blum Hardware Company, $25.15 per ton. Centray Foundry Company, 74 1-2 cents per foot. R. D. Wood & Company, $22.50 per ton. Hardy Greenwood, $23 per ton. Several bids were received showing many prices for valves, fixtures, etc.

Colfax, Wis.—Citizens have voted $14,-000 bonds for water works. Engineer is A. F. Thompson of Chippewa Falls.

CONTRACTS AWARDED.

Thomasville, Ala.—To Sullivan, Long & Hagerty, of Bessemer, Ala., at $18,000, for installation of water works, including 1,890 ft. of 8-in. cast iron pipe; 2,690 ft. of 6-in. c. i. pipe; 8,000 ft. of 2-in. galvanized pipe; 14 double nozzle hydrants; five 8-in. and six 6-in. gates; two 80,000-gal. concrete reservoirs; deep well, air lift machinery; one 2-stage, 750-gal. p. m. capacity pump; pump and compressor both motor driven with 220-240 V-3 phase, 60 cycles, motors. Edgar B. Kay is City Engr.

Montague, Cal.—For water system, except pumping equipment, to C. D. Vincent, Oakland, at $20,700.

Atlanta, Ga.—For furnishing 2,000 meters contract was divided evenly among Hersey Mfg. Co., of South Boston, Mass., Henry Worthington, of New York, and Thomson Meter Co., of Brooklyn.

Chicago, Ill.—By Board of Local Improvements for water supply pipes in various streets to Simon Ryan, Edward Connor and Maclachy Murphy, and for water service pipes to Daniel Hardin, J. J. Renn, Washington Plumbing & Heating Co., and David Walsh.

South Bend, Ind.—For c.-i. water pipe and specials for Water Department during 1914 to Lynchburg Foundry Co., Lynchburg, Va.

Cherokee, Ia.—To C. B. Reynolds, of Council Bluffs, contract for labor required to put in 5,265 ft. of 6-in. water main, 7 fire hydrants and 8 valves, being extension to city water system. Amount of bid $1,325. W. Shardlow is City Clk.

Pittsburg, Kan.—Henry R. Worthington of Kansas City was successful bidder on compressor for city waterworks plant. City commissioners awarded him contract to install Laidlaw-Dunn-Gordon compressor at price of $9,200.

Sanborn, Minn.—For installation of water system, to National Co., South Bend, Ind., at $8,645.

Buffalo, N. Y.—For water purification plant at new intake pier to Electro Bleaching Co., New York, at $3,325.

Schenectady, N. Y.—Bids have been opened for 6,000 ft. of cast-iron pipe for Bureau of Water. This is for new 6-in. water mains. Award went to R. D. Wood & Co., of Philadelphia. W. D Goodale of this city was awarded contract for laying of 4,500 ft. of these mains, his bid being by large margin lower than that of any of the several other bidding firms. Following bids were opened for laying of 6-in. water mains: W. D. Goodale, $962.50; T. R. Crane, $1,653; Kellam & Shafer, $1,542; Ellis B. Edgar, Seneca, $2,302; Beckwith Bros., $2,812.50; John L. Nolan, $1,114; John Allen, $1,317.50. Following bids were received for the 6-in. cast-iron mains: U. S. Cast Iron Pipe & Foundry Co., Philadelphia, $23.90 per ton; Standard Cast Iron Pipe & Foundry Co., Bristol, Pa., $23.90; Charles Miller & Son, Utica, $22; Donaldson Iron Co., Emanus, Pa., $22.90; R. D. Wood & Co., Philadelphia, $21.70. Following bids were received for water hydrants and valves: Eddy Valve Co., Waterford, $1,317; Chapman Valve Co., Indian Orchard, Mass., 10-in. only, $600; Ludlow Valve Co., Troy, $1,288.80. Awarded to Ludlow Co. for hydrants, and Chapman Co. for valves.

Barberton, O.—To Keystone Drille Co., of Beaver Falls, Pa., at $2,085 for furnishing of two deep-well pumps for new water source auxiliary. Gangle-Harbaught Construction Co., of this city, was given contract for two 15-h.p. motors.

Steubenville, O.—By Board of Control, for construction of filtration plant, to Norwood Construction Co., Florence, Mass., at $130,000.

Stigler, Okla.—The Worthington Meter Co., of Chicago, has been awarded contract to furnish city of Stigler with 200 meters.

Aspinwall, Pa.—For improving water and light plans as follows: Erie City Iron Works, boilers and stokers, $4,708; Harrisburg Foundry & Machine Co., engines, $3,760; Ft. Wayne Electric Co., generators, $2,059, and Best Eng. & Supply Co., piping, $2,039.

Bethlehem, Pa.—To R. E. & E. H. Neumeyer, of Bethlehem, at $3,800, for laying of water mains, and to Tippett & Wood, of Phillipsburg, Pa., at $14,534, for construction of steel tank, and M. B. Biery, of Allentown, Pa., at $4,550, for boring of well.

Erie, Pa.—To Rensselaer Valve Co., of Troy, N. Y., at about $1,200, for 10 fire hydrants, 48 6-in. valves and 6 4-in. valves, together with 48 valve boxes.

Providence, R. I.—Contracts with Fiber Engineering Works for new electric pump for Pettaconsett pumping station and that with Narragansett Electric Lighting Company for power to operate it, will probably be shortly signed by Mayor Gainer and Commissioner Slade of public works department. New pump is to cost in neighborhood of $20,000.

Centralia, Wash.—By City Comn. to Harbor Paving Co., Aberdeen, for reservoir for gravity system, at $22,920.

Milwaukee, Wis.—Contract for construction of big steel and concrete crib for new water intake tunnel, 4,000 ft. from shore at Lake Park, has been awarded to Wisconsin Dock & Dredge Co., of Sheboygan, at $69,700. Crib will be 60 ft. in diameter and will stand in 40 ft. of water. When it is completed tunnel men will start there and after sinking 18-ft. shaft under crib to depth of about 40 ft., will start shoreward to meet other tunnel.

Windsor, Ont.—For c.-i. water pipe, to Gateshore Thomson Pipe & Foundry Co., Hamilton, Ont., at $31.50 ton f. o. b. cars, Windsor.

LIGHTING AND POWER

Ozark, Ala.—Bond issue of $25,000 has been voted to increase light and water plant.

Covina, Cal.—Bids for material for ornamental street lighting system will be received in May. Floyd G. Dessery is Engr., Central Bldg., Los Angeles.

Oak Park, Cal.—Movement for electroliers on 35th St. has been taken up.

Sacramento, Cal.—Resolutions have been passed by city commissioners authorizing City Electrician Pearce to draw plans and specifications, with estimates of probable cost, for construction of municipal electric light distribution plant.

Sacramento, Cal.—Bonds will be sold at once to amount of $113,000 for installation of street lights.

Willimantic, Conn.—Installation of "White Way" on Main St. is being discussed.

Willimantic, Conn.—Installation of 47 ornamental iron poles with a 100-watt lamp and four 60-watt lamps is under consideration.

Springfield, Ill.—Notices of public hearing on ornamental lighting system for Adams St., between Lewis and Tenth Sts., have been sent out.

East Gary, Ind.—Petition has been filed with Public Service Comn. for permission to issue $9,000 bonds to erect municipal electric light plant.

Indianapolis, Ind.—Order has been given Citizens Gas Co. by Board of Public Works to lay gas mains in various thoroughfares.

Manilla, La.—Citizens have voted $20,000 bond issue for installation of municipal electric light plant.

Baltimore, Md.—Contract will be let in near future by city officials to install horizontal electric signs outside entrances to various department offices in City Hall.

Easton, Md.—Commission of four citizens has been appointed by Mayor Higgins to erect $30,000 electric light plant.

Comfrey, Minn.—W. S. Buck, Minneapolis, has been engaged by Council as consulting engineer in connection with construction of municipal electric light plant; $8,000 bonds have been voted for same.

Duluth, Minn.—See "Water Supply."

Ord, Neb.—At special election Ord voted $2,300 bonds for municipal electric plant and water works extension.

Binghamton, N. Y.—Alderman Sampson will introduce his ordinance calling taxpayers' election to determine whether $148,000 bonds voted for erection of municipal lighting plant shall be legalized and plant constructed.

Weedport, N. Y.—Date of special election on municipal lighting plant has betn changed from April 28 to May 4, owing to error in original notice. Notice will now call for vote on bond issue of $18,000, village to take current from Niagara Power Co. Taxpayers will also vote on proposition to contract with Empire Gas & Electric Co., of Auburn, to furnish street lighting for period of five years at yearly rate of $2,296.

Warsaw, N. C.—Contract has been signed whereby the J. B. McCray Co., of Atlanta, is to make survey of town and furnish map and blue prints showing complete details of an electric plant, water mains, etc. Also estimate of cost of installing and maintaining electric light plant, water and sewerage system to cover all parts of town. Estimated cost, $35,000 to $50,000.

Winston-Salem, N. C.—Special election will be held June 23 to vote on bond issue of $750,000, of which, if carried, $250,000 will be used for construction of a municipal lighting and heating plant. G. F. Hinshaw is City Engr.

Butler, Pa.—Specifications for street lighting have been adopted and bids will be advertised at once.

Harrisburg, Pa.—Ordinance authorizing placing of ornamental pedestal lights at Sixth and Maclay, Third and Verbeke, 13th and Market and 13th and Derry has been introduced.

Luzerne, Pa.—Ordinance has been adopted authorizing execution of contract with Luzerne County Gas & Electric Co., a corporation of State of Pennsylvania, for supply of electric lights for lighting streets of Luzerne.

Nashville, Tenn.—According to plans adopted by Commissioner Lyle Andrews and approved by Board of City Commissioners, 40 artistic metal lamp standards will be placed on Capitol Blvd. Contract for standards was awarded to Union Metal Mfg. Co. at meeting of board on bid of $2,320.

Franklin, Tex.—Sum of $17,500 have been voted for municipal electric light plant and water works.

Norfolk, Va.—Establishment of lighting plant for Seventh Ward is being considered.

Norfolk, Va.—Board of Control has referred to R. A. Smith, superintendent of electrical affairs, application of the Granby Street Improvement Association for installation of 56 ornamental iron brackets, each holding a cluster of five electric lights, on trolley poles in Granby St., between Butte and 25th Sts.

Janesville, Wis.—New system of street lighting will be experimented with in residence district by city commissioners in view of establishing permanent system of having light on nearly every corner.

Milwaukee, Wis.—Plans for uniform lighting of business streets on north side have been discussed at meeting of the North Side Civic League.

CONTRACTS AWARDED.

Springfield, Ill.—Bids for installation of 750 K. V. A. turbo generator at river have been opened before City Commission. Proposals varied from $18,000 to $20,000. Lowest bidder was Kerr Turbine Co., of Chicago, whose bid covering generator, turbine and condensor, was $17,985. Bids offered by other companies, and specifications were as follows: DeLaval Steam & Turbine Co., of Trenton, N. J., $11,600 for generator and turbine; Kerr Turbine Co., of Wellsville, N. Y., $17,985 for generator, turbine and condenser; $10,240 without condenser; Ridgeway Dynamo & Engine Co., of East Pittsburgh, Pa., $18,520 for condenser, generator, turbine and switchboard, $10,300 for generator alone; Western Electric Co., of Chicago, $11,207 for generator and turbine; $5,213 for condenser; $2,608 for switchboard; Westinghouse Machine Co., of Chicago, $18,650 for complete equipment, including generator, condenser, switchboard and turbine. C. H. Wheeler Mfg. Co., of Philadelphia, Pa., $5,050 for condenser only; Harry R. Worthington of New York, $5,128 for condenser only; Allis-Chalmers Mfg. Co., of Milwaukee, Wis., $11,652, and for switchboard, $3,300.

Indianapolis, Ind.—Board of Public Works has awarded contract for electric street lighting to Merchants' Heat & Light Co. Contract is for period of ten years, beginning April 1, 1915. Prices city will pay under contract are: Ten ampere alternating current inclosed flame carbon arc lights, $41.98 a light a year; 100watt series Tungsten incandescent lights outside of underground district, $17.83 a light a year; 100-watt series Tungten to be used as top light of three or five-light cluster, $8.92 a light a year; 100-watt series Tungster on ornamental standards in underground district, $27.71 a light a year; cluster of three 100-watt series Tungstens on ornamental standard in underground district, $40.35 a cluster a year; cluster of one 100-watt and four 60-watt series Tungstens on ornamental standard in underground district, $45.18 a cluster a year; current for lighting all buildings owned or controlled by city, .0195 a kilowatt hour. City officials estimate saving of from $70,000 to $75,000 a year on basis of number of lights already in service under present contract.

Louisville, Ky.—The Welsbach Lighting Co. has been awarded contract for lighting parkways and interior parks for six months. There are 270 lights and they will cost $3 a month each. Contract Committee wil consider lights for entire system next year.

Mount Vernon, O.—Bids have been submitted by three firms for contract for building electric power plant and equipping Knox County infirmary for electric lighting. Bids were as follows: Mt. Vernon Electric Co., $2,427.30; Smoots & Dorsey, $2,636; Avery-Loeb Electric Co., $2,477.50. Including two alternates, both of which were accepted, bids were as follows: Mt. Vernon Electric Co., $2,586,30; Smoots & Dorsey, $2,821; Avery-Loeb Electric Co., $3,055. Contract was awarded by County Commissioners to Mt. Vernon Electric Co.

Berlin, Ont.—By City Light Comn., to R. D. Wood & Co., Philadelphia, Pa., for 350,000 cu. ft. gas holder.

FIRE EQUIPMENT

Grass Valley, Cal.—Purchase of another fire auto truck and chemical engine has been authorized; estimated cost $5,000.

San Francisco, Cal.—Board of Fire Commissioners wants appropriation of $494,200 for purchase of motor apparatus.

Bridgeport, Conn.—Sum of $4,000 has been allowed Board of Fire Commissioners for tractor.

Bridgeport, Conn.—Fire commissioners have decided to purchase two Cross tractors.

Moline, Ill.—Bond issue of $34,500 has been authorized to motorize city's fire department.